# SCIENTIFIC AMERICAN

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## THE BLACKWELL'S ISLAND BRIDGE.

Few great engineering works have been so favorably conditioned by nature as the Ravenswood Bridge which has been projected and is now in process of construction at Blackwell's Island. Where each abutment is located solid rock is reached a short distance below the surface, and the anchorages at the termini of the bridge on Long Island and at New York are to be secured in forty feet of solid natural rock. On Blackwell's Island the anchorage will be in twelve feet of natural rock and re-enforced by forty feet of solid masonry.

The several sections of the bridge being comparatively short, can be constructed with far less expense proportionately than a bridge having a single long span.

Such great natural advantages as these have not been found in connection with any other bridge in this country or in the world. These natural conditions alone will effect a saving of about ten millions of dollars in excavations and foundations, and shortened spans, all of the work being positive and straightforward; there being no unknown conditions to be developed as the work progresses. In our engraving we show the coffer-dam and breakwater surrounding the excavations commenced at Ravenswood, L. I. The coffer dam is 140 feet long, and 70 feet wide. The breakwater is 162 feet long, and 85 feet wide. The piers are to be 60 feet wide and 120 feet long at the base, and 100 by 40 feet at the top. Each pier will support twelve wrought iron columns about 24 inches in diameter made of 2½ inch double refined iron. There are to be three chain cables, as shown in the middle view at the top of the engraving. The bridge together with its approaches will be 10,043 feet long. The bridge spans will be respectively 784 and 618 feet long, and will have a clear height above the water at mean tide of 154 feet.

Two central railroad tracks each 14 feet wide, two carriage ways each 9 feet wide, and two sidewalks each 5 feet wide in the clear, all on the same level, form the roadway of the bridge, which will be 76 feet wide.

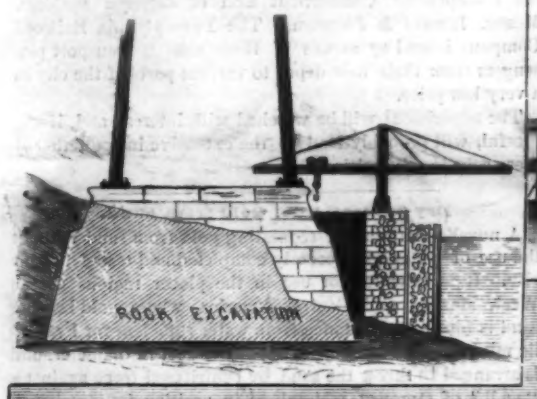
The four towers which support the three chains for the main spans are to be made of Phœnix columns well braced in every direction. They will be 46 feet long on the top and 100 feet long on the base, and 260 feet high. The long spans will be trussed chain suspension bridges, something like the Point Bridge at Pittsburg, but with upper chord curved.

There will be two chain cables at each side, crossing each other at the center on a pin joint, and joining each other by symmetrical curves, one above the other.

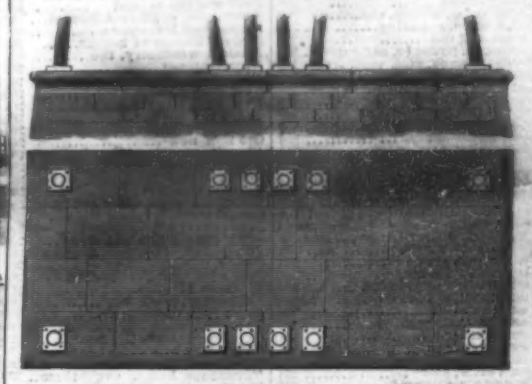
The total load is equally distributed between the two cables, and the resulting tension is always sufficient to more than counterbalance any compression resulting from unequal loading, the space between the two being thoroughly braced by diagonal braces. The chains will be put in place by means of small temporary wire cables, and will be allowed to adjust themselves to a natural curve.

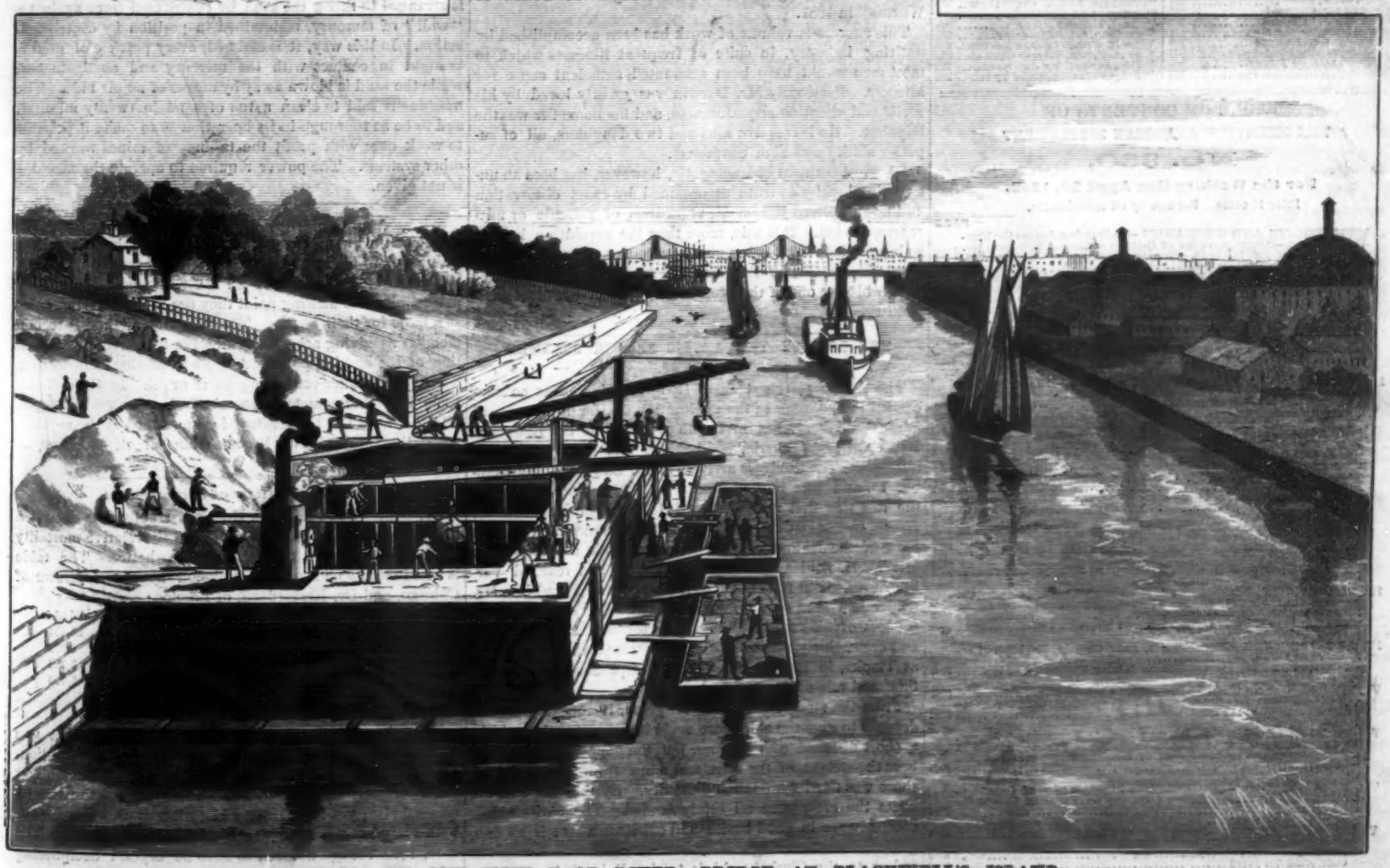
The weight of the platform, being attached to the lower chains, half on each side, will draw the opposite upper chains nearly into position, and by temporarily loading the platforms the chains can be made to take the curves designed for them. The intermediate bracing will then be put in and the temporary loads removed. This plan was designed by Messrs. T. C. Clarke and A. Bouzano, Members American Society of Civil Engineers, and, it is believed, overcomes all objection to trussed chain suspension bridges.

The total cost of the bridge, including real estate, is estimated at six million dollars. The work will proceed actively as soon as the water becomes warmer, probably by the first of June next. It will take about two and a half years to complete the structure. Dr. Thomas Rainey, of Ravenswood, is the contractor and financial manager of the enterprise; and if he succeeds in promptly carrying the scheme through, as is now promised, he will receive the universal and well-deserved praise of the people of Long Island as well as of this city and Brooklyn, all of which it will unite by rapid railway intercourse, for the great and lasting boon which will have been conferred upon them.









PROGRESS OF THE NEW EAST RIVER BRIDGE AT BLACKWELL'S ISLAND.

# Scientific American.

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NEW YORK, SATURDAY, APRIL 29, 1882.


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THE SCIENTIFIC AMEKICAN SUPPLEMENT

**No. 330,**

**For the Week ending April 29, 1882.**

Price 10 cents. For sale by all newsdealers.



**CHARLES DARWIN.**

Charles Robert Darwin, whose influence upon the current of modern thought has been surpassed by no other scientific investigator, died at his residence near Orpington, England, Wednesday, April 19.

Mr. Darwin was born at Shrewsbury, England, February 12, 1809, inheriting rare qualities for scientific observation and philosophic thought. His father was a worthy though not eminent member of the Royal Society, and his grandfather was the celebrated Erasmus Darwin, author of "The Botanic Garden." His maternal grandfather was the founder of the famous pottery works at Etruria, Josiah Wedgwood, also a member of the Royal Society. His early education was received at the public school in Shrewsbury, whence he passed to the University of Edinburgh, where he spent two years. He then went to Christ's College, Cambridge, where he was graduated in 1831. His bent for natural research was not diverted by his schooling; and soon after his graduation he read a paper on marine zoology, giving such promise of scientific ability that he was offered the position of naturalist on the now historic Beagle, soon to start on a cruise of scientific exploration round the world. Five years were spent on this cruise, during which those suggestive observations were made which led to the development of a new theory of the origin of species.

Returning from this voyage in 1836 Darwin made ready for publication his "Journal of Researches," and in 1840-42 he edited the "Zoology of the Voyage of the Beagle." Shortly after he published his classic works on "The Structure and Distribution of Coral Reefs." These works were rapidly followed by "Geological Observations on Volcanic Islands," in 1844, and "Geological Observations in South America," in 1846. Meantime his contributions to scientific publications and the transactions of scientific societies were numerous and valuable, as they were throughout his long and active life. The two-volume "Monograph of the Family Cirripedia," was published in 1851 and 1853, and soon after his two volumes on the fossil species of the same family. In 1853 the Royal Society awarded him the royal medal, and in 1859 he received the Wollaston medal of the Geological. His epoch marking "Origin of Species by Natural Selection," appeared the same year. The controversies provoked by this work probably did more to attract popular thought to questions of natural science, and to change the popular as well as scentific mode of regarding such topics, than any other influence of the century.

The later works of Mr. Darwin bear evidence of his untiring industry in collecting facts and his marvelous faculty for the rational interpretation of such facts. The work on the "Fertilization of Orchids by the Agency of Insects" appeared in 1862; "Habits and Movements of Climbing Plants" in 1865; "The Variation of Plants and Animals under Domestication" in 1867; "The Descent of Man, and Selection in Relation to Sex" in 1871; "The Expression of Emotions in Man and Animal" in 1875; "Insectivorous Plants" in 1876; "The Effects of Cross and Self Fertilization in the Vegetable Kingdom" in 1877; "The Different Forms of Flowers and Plants of the Same Species" in 1880; and "The Formation of Vegetable Mould through the Action of Worms" in 1881.

This enormous volume of work has been accomplished by untiring industry, in spite of frequent illnesses which to most men would have been accounted sufficient cause for idleness. Personally Mr. Darwin was greatly loved by his social and scientific acquaintances, and his home life was the happiest. He leaves five sons and two daughters, all of superior ability and high characters.

His most eminent characteristic, however, has been an unswerving loyalty to truth as obtained by exact observation and unprejudiced judgment, regardless of ridicule or misrepresentation. It is this, more than the revolution he has so largely helped to bring about in modern thought, or the admirable quality of the scientific work done by him, that makes his life one of the precious legacies of the nineteenth century.

**THE LOSS OF THE ARCTIC SEARCH STEAMER RODGERS.**

The Arctic search steamer Rodgers, which was so successful last summer in the exploration of Herald Island and Wrangell Island, has met with disaster at St. Lawrence Bay Northern Siberia, whither she had gone for winter quarters. The Rodgers arrived in St. Lawrence Bay October 15, and was burned January 1, 1882. Intelligence of the loss was first received April 18, through Mr. Jackson, *Herald* correspondent, with the party in search of the lost crew of the Jeannette, who met, on the 6th, a courier from Mr. W. H. Gilder, of the Rodgers, who had reached Verkhoyansk, about four hundred miles north of Yakutsk. Mr. Gilder had been sent on by Lieutenant Berry to announce the loss of his vessel and to appeal for help for the officers and crew, thirty-six in number, who were awaiting supplies at Tlapka, in Eastern Siberia, near Cape Serdze, some two thousand miles from Yakutsk.

From the meager details so far given, it appears that endeavors to save the ship were made in vain. She lay within a short distance of the shore, but the young ice could not bear the weight of the men, and a line from the ship to the shore was fixed with much difficulty. By this line and the boats the crew were all safely landed. The entire ship's company are in good health and spirits. There is no danger of their starving. Governor Tchernaieff has given orders to the Chukche chiefs to do all in their power to assist the shipwrecked crew. Three months' provisions were saved from the ship. Tupkan is near Cape Serdze Kamen.

**Society of Mechanical Engineers.**

The annual convention of the American Society of Mechanical Engineers began in Philadelphia, April 19, Prof. R. H. Thurston, of the Stevens Institute, in the chair. The roll of membership now contains three hundred and twenty-five names. The first paper was read by W. R. Eckert, mining engineer, Comstock Mines, on "The Chronograph for Engineering Purposes, with the Hipp Escapement." The next was by Prof. Thurston on "The General Efficiency of the Steam Engine."

The afternoon was devoted to eulogies of the late Alexander H. Holley. An oration was delivered by James C. Bayles, after which speeches were made by Professor Thurston, Coleman Sellers, of Philadelphia; Eckley B. Coxe, of Luzerne County, Pa.; J. C. Hoadley, of Boston; R. W. Hunt, of Troy; William Metcalf, of Pittsburg; Charles T. Porter, of Philadelphia; J. T. Holloway, of Cleveland; L. B. Moore and W. E. Partridge, of New York city.

**The Glossograph.**

A speech recorder called a glossograph has been invented by A. Gentilli, of Vienna. It is described as a combination of delicate levers and blades, which, being placed upon the tongue and lips and under the nostrils of a speaker, are vibrated by the movements of the former and the breath flowing from the latter. This vibration is transmitted to pencils. These transcribe the several signs produced by the action of the tongue and lips and the breath from the nostrils upon a strip of paper moved by a mechanical arrangement, and thus a special system of writing, which may be termed glossography, is produced. This is based upon the principle of syllable construction and combination of consonants.

**Hansom Cabs.**

The first extensive introduction and use of Hansom cabs in this country is to take place in Philadelphia, Pa., in a short time, by the Pennsylvania Railroad Company. The cabs are to be constructed in the best manner after the English pattern, and a contract for thirty has been given to the enterprising Connecticut firm of carriage builders, Messrs. Hincks & Johnson. The Pennsylvania Railroad Company intend by means of these cabs to transport passengers from their new depot to various parts of the city at a very low price.

The experiment will be watched with interest, and, if successful, will probably lead to the extensive introduction of these cabs in other cities.

**Dry Separation of Gold from Sand.**

A novel apparatus for separating gold from sand without the use of water was recently completed and tested in this city. It is intended for use in the placer regions of the West, Mexico, and Central America, where gold-bearing sand is found at a distance from water sufficient for hydraulic mining. The machine is about five feet in diameter, and is arranged to throw the sand by centrifugal force against a "wall" of mercury, maintained in position by centrifugal action. In this way, it is claimed, every particle of gold is brought in contact with the mercury and amalgamated, while the sand is blown away by means of an air blast. The machine is said to clean a ton of sand in twenty minutes, and to be so thorough in its operation as to make it possible to work over with profit the tailings of mines worked by other systems. The power required to operate the machine is not given.

**Melting Point of Fats.**

The method adopted by the "Society for the Mineral Oil Industry," in Halle a. S. is to be preferred for the safest and most accurate results above all other methods. Instead of determining the melting point they use the solidifying point as a basis for their results. The following method is recommended as giving accurate results for the direct determination of the melting point: A cylinder having thin walls is heated in a beaker containing water or oil. In the cylinder there is a thermometer whose bulb is only partly dipped into the fat. The temperature is determined at the moment when the fat begins to become transparent.—*J. Merz, in Chemiker Zeitung.*

**Relative Safety of Anæsthetics.**

Dr. Ormsby, of the Meath Hospital, Dublin, has compiled the following table of the absolute and the relative mortality caused by the use of the leading anæsthetics. The table is based mainly on statistics gathered by Dr. Andrews of Chicago, and Dr. Richardson, of London:

| Agent employed. | Deaths. | Admins. | Deaths. | Admins. |
|---|---|---|---|---|
| Ether | 4 in | 92,815, | or 1 in | 23,204 |
| Chloroform | 53 in | 152,360, | or 1 in | 2,873 |
| Mixture of chloroform with ether | 2 in | 11,17., | or 1 in | 5,588 |
| Bichloride of mythylene | 2 in | 10,000, | or 1 in | 5,000 |

**Restoring Worn Coins.**

Recently while Dr. A. H. Best, of Savannah, Ga., was silver-plating a small article with silver cyanide solution, he used an old Spanish silver coin as anode. The coin was worn perfectly smooth and had been hammered to twice its original size; yet in a little while after it was put in the bath every letter and figure became plainly visible. The date, 1800, though defaced so as to be beyond deciphering with a powerful glass, became plain.

PROGRESS OF THE NEW EAST RIVER BRIDGE AT BLACKWELL'S ISLAND.



## ASPECTS OF THE PLANETS FOR MAY.

### SATURN

is evening star until the 6th, and wins the place of honor on the May annals, as he is the first of the five planets traveling to the same goal to reach conjunction with the sun. This prominent point in his course is reached on the 6th, at 3 o'clock in the morning. He is then, as the word conjunction implies, joined to the sun, rising and setting with him, completely hidden in his rays, and, of course, invisible. At that time the earth, the sun, and Saturn are in a straight line, with the sun in the center. Saturn is at his greatest distance from the earth, being more than ten hundred million miles away, instead of about eight hundred and thirty million miles, his distance at opposition.

Conjunction finishes Saturn's course as evening star. He then passes from the eastern to the western side of the sun, becomes morning star, and, about a month hence, may be seen shining faintly in the east not long before sunrise. He will move every day farther from the sun and rise earlier, until, by the last of June, he will appear above the horizon as early as 2 o'clock, and become an object of constantly increasing interest to observers through the summer and autumn, presenting a brighter phase than he has done for thirty years. The eyes of the whole observing world will scan this superb planet with intense attention as he makes his way from conjunction to opposition, and if there is power in the telescope to learn anything new concerning his complex system it will be accomplished.

It is an interesting planetary event of the month that Saturn and Neptune reach conjunction with the sun on the same day, the former at 3 o'clock in the morning and the latter at 6 o'clock in the afternoon. Therefore, a straight line drawn from the earth through the sun and Saturn would, if extended, pass near the huge bulk of Neptune, the planet that travels on the system's remotest bounds, and is only exceeded in size by Jupiter and Saturn.

A close conjunction of Saturn and Neptune takes place at 8 o'clock on the morning of the 11th, Saturn being twenty-two minutes south. Neptune for months has been slowly gaining upon the steps of his brother planet, and has at last overtaken him. After the conjunction he will take the precedence, and be the first to make his advent in the morning sky. As he is unfortunately invisible, his course must be traced by the eye of fancy. Such is the precision of mathematical calculation, and so simple are the laws that rule the solar scheme, that we are as sure of the point of space in the star depths occupied by this far-away Neptune as if he were as plainly discernible to the naked eye as the majestic sun from whom he borrows light to shine as a faint disk in our great telescopes. Even the superb Saturn is as effectually blotted from our vision as his more distant brother planet. For a time his presence in the sky is only visible to the eye of imagination, which, gifted with transcendent power, cannot only behold a pale star serenely following its appointed course amid the dazzling beams of the all-powerful sun, but can span the distance separating us from the Saturnian system with its rings and moons, and picture scenes that words are powerless to describe.

Saturn sets on the 1st of the month a few minutes after 7 o'clock; at the end of the month, he rises not far from half past 3 o'clock in the morning.

### NEPTUNE

is evening star until the 6th, and then morning star for the rest of the month. He reaches his conjunction with the sun at 6 o'clock on the afternoon of the 6th, when, in his turn, he comes into line with the sun and the earth, the sun being in the center. His distance, then, from us is more than twenty-eight hundred million miles. Incalculable as this distance is to finite powers it is more than probable that other planets pursue their yet undetected course beyond the vast sweep that marks his orbit.

The movements of Neptune and Saturn are so closely interwoven during the month that the history of the one includes that of the other. For the brother planets travel almost side by side as they pass conjunction on the same day, meet and pass each other a few days later, and change places on the celestial track, Neptune now preceding and Saturn following.

Neptune sets on the 1st of the month about a quarter after 7 o'clock; at the end of the month he rises a few minutes before half past 3 o'clock in the morning.

### JUPITER

is evening star until the 30th, when, at 3 o'clock in the morning, he takes his turn in coming into conjunction with the sun. Jupiter, the sun, and the earth are then in a straight line, with the sun in the center, the giant planet being nearly six hundred million miles from the earth. He is so much brighter than Saturn that he will be visible when nearer the sun, probably within a few days of conjunction, when he, too, will disappear from mortal vision, eclipsed in the sun's bright rays.

Before he is lost to sight he makes his farewell appearance in a charming tableau in the western sky; for, on the 5th, he pays his respects to Venus, fairest of the stars, passing fifty-nine minutes south of her. The conjunction will be well worth seeing, for the two largest planets that grace the firmament will then be side by side, though they will not present the brilliant aspect that distinguishes their nearest approach to the earth. The planets set within a few minutes of each other, about half past 8 o'clock, nearly an hour and a half after the sun. Venus must be looked for about five degrees and Jupiter four degrees north of the sunset point. For an hour this brilliant picture will be painted on the sky in a vivid coloring that will be beautiful to behold, one of the loveliest views of a month when the planets are in a condition of tireless activity.

Jupiter sets now at thirty-seven minutes past 8 o'clock; at the end of the month he rises nearly with the sun at half-past 4 o'clock in the morning.

### MARS

is evening star during the month, and his movements are devoid of incident. His brother planets have absorbed all the interest and left him to plod along with slow step and lessening luster toward the goal they have passed. On the 4th Mars is in aphelion, or his most distant point from the sun. On the 18th he passes through Præsepe, a cluster of stars in the constellation Cancer, and thus his position is easily identified.

Mars sets now at twenty minutes before 1 o'clock in the morning; at the end of the month he sets about half past 11 o'clock in the evening.

### URANUS

is evening star, and, like Mars, is simply a looker-on while the other planets play their more active roles. He is moving slowly along in the constellation Leo, his position in the heavens differing slightly from that of last month. His present right ascension is 11h. 4m., and his declination is 6° 47′ north. Mars and Uranus will be, at the end of the month, the only planets traveling toward conjunction.

Uranus now sets a few minutes before 3 o'clock in the morning; at the close of the month he sets a quarter before 1 o'clock.

### VENUS

is evening star, and stands first on the list as the peerless representative of starry beauty. She is now a fascinating object in the western sky, growing brighter and larger at every successive appearance as she speeds on her eastward course and approaches the earth. She is in conjunction with Jupiter on the 5th, when, as we have already described, the fairest of the stars and the star of imperial Jove make a charming appearance in the glowing west. She is near Mercury on the 30th, and the two inner planets will then be seen to rare advantage. All through the year Venus will reign first and foremost in the star-spangled firmament, not only for her great importance in connection with the transit, but also for her own serene and transcendent loveliness.

Venus now sets at twenty-one minutes past 8 o'clock; at the close of the month she sets at twenty-two minutes past 9 o'clock.

### MERCURY

is evening star after the 1st, and though we place him last on the list he plays a prominent part on the May records. On the 2d he is in superior conjunction with the sun, when he passes to his eastern side and becomes evening star. He follows in the track of Venus, oscillating in a straight line east of the sun towards his eastern elongation. As his orbit is within that of Venus, and he is nearer the sun than Venus, he is never more than twenty-nine degrees from the sun at his elongation, while Venus is sometimes forty-seven degrees distant under similar conditions. Mercury, therefore, traveling at a more rapid pace—for the nearer the sun the faster the planet travels—will overtake Venus on the 30th, the day before he reaches his eastern elongation. A rarely beautiful conjunction then takes place between Mercury and Venus, the swift-footed planet passing a degree and three-quarters west-northwest of his fairer neighbor. The planets must be looked for in the northwest, Mercury four degrees and Venus three degrees north of the sunset point. As they are above the horizon an hour and a half after sunset a fine view of the conjunction may be anticipated.

Mercury is in conjunction with both Saturn and Neptune on the 4th, passing about two degrees north, but all three planets are too near the sun to be visible.

Mercury is in conjunction with Jupiter on the 13th, when, as the planets do not set till after 8 o'clock, bright-eyed observers may see the smallest and the largest world of the sun's family only two degrees apart.

Mercury is in his descending node on the 2d, and in perihelion on the 7th.

Thus it will be seen that the fiery little planet traveling nearest the sun will not be idle as the month of May runs its course. The most favorable time in the whole year for seeing Mercury as evening star with the naked eye commences about the middle of the month and continues through the first part of June. Any painstaking observer with good visual power will be sure to find him east of the sun and about three degrees north of the sunset point, while the proximity of Jupiter and Venus at the time of his conjunctions with them will be a sure guide to his position.

Mercury now rises about 5 o'clock in the morning; at the close of the month he sets at twenty-two minutes past 9 o'clock in the evening.

### THE MAY MOON

fulls on the 3d, and is not remarkable. But the new moon of the 17th plays a distinguished part. She signalizes the commencement of her course by causing a total eclipse of the sun, invisible here, but visible in the eastern hemisphere, the path of totality passing across the north of Africa, the southern part of Asia, and ending in the Pacific Ocean.

The new moon also signalizes her course on the same day by a most interesting phenomenon.

### THE OCCULTATION OF JUPITER.

At twenty-four minutes after 7 o'clock, Washington time, which means twelve minutes later New York time, and twenty-four minutes later Boston time, the moon, only sixteen hours old, will pass directly over the planet Jupiter, and occult or hide him from view. As from new moon to full, the moon moves with the dark edge foremost, Jupiter will disappear at the dark limb, producing a startling effect as if a star were suddenly annihilated from the sky. There are few observers who will possess the practiced eye required for witnessing an occultation with the moon so near the sun. But we are assured that it can be done by those who know where to look both with the naked eye and by the aid of a good opera glass or small telescope. Jupiter on that evening will be 1° 18′ north of the sunset point, 10° east of the sun, and will set about 8 o'clock. The occultation of a planet by the moon is a rare sight, and that of Jupiter by the slender crescent will be something to remember for a lifetime. The moon seems to be satisfied with the production of a total solar eclipse and an occultation, and has nothing more to do with the planets during the month, except to pass at a respectful distance near Mars on the 22d and near Uranus on the 25th.

Telescopic observers will find interesting objects for observation. Venus preserves her gibbous phase, the illumined portion of her disk diminishing as she approaches the earth like the moon from the full to the last quarter.

Mercury, though a disappointing object in the telescope, takes on the same phase as he rapidly gains upon the slower moving Venus. The numerous conjunctions of the prominent planets present aspects of exceeding interest for amateur observers with small telescopes, and any amount of painstaking that results in a sight of the occultation of Jupiter will be abundantly rewarded.

It is seldom that so many grand celestial events occur within the compass of one short month. The conjunction of the three giant planets—Saturn, Neptune, and Jupiter—with the sun; the conjunction of Mercury with Saturn and Neptune on the same day; the conjunctions of Venus with Jupiter, Saturn with Neptune, Mercury with Jupiter, and Mercury with Venus within an unusually short period of time; the superior conjunction of mercury; the total eclipse of the sun; and the occultation of Jupiter by the moon indicate an extraordinary condition of planetary activity, and a brilliant succession of interesting incidents that will make star gazing as delightful as it is instructive.

Wisely did ancient astronomers give the name of wanderers to the bright stars that are forever changing their places, now clustering near the sun, and now getting as far away from him as possible; now traveling in pairs and trios, and now as far apart as the east is from the west; now glowing in the twilight sky, and now heralding the approaching dawn.

And yet amid this apparent intricacy nothing in astronomy is more easy than to become familiar with the position and movement of each separate planet, and learn to recognize each member of the brotherhood by traits as characteristic as those in which friend differs from friend, while all the restless ways, the waxings and wanings, and the unremitting changes are but shining illustrations of the simple laws that hold the planets in their places and sway them in their courses in heavenly harmony around the great central sun.

## Comet *a* of 1882.

Many observations have been made by me of the new Wells comet, the first observation being on the morning succeeding its discovery. From what was at first a faint object with moderate apertures, it has steadily grown in brightness, until it can at this date be readily picked up with a telescope of three inches aperture, and afterward seen with a still smaller objective. My latest observation was made last evening, and although interfered with by the light of an exceptionally brilliant aurora, it showed a marked increase in brilliancy over previous observations. With its present rate of increase in size and brilliancy it must in a few weeks become a beautiful object even to the naked eye. As a matter of record I give herewith a drawing of its telescopic (inverted) appearance on the evening referred to, April 16, 1882.

It is now a very pretty telescopic comet. The head is bright and solid looking, the tail delicate and nearly straight. The head appears larger than the width of the tail immediately joining it, and has very much increased in apparent size since discovery.

The comet's approximate position on May 1 will be: Right ascension, 20 hours 38 minutes; north declination, 68 degrees 50 minutes. On May 9: R. A., 23 hours 5 minutes + 74 degrees 27 minutes.

WILLIAM R. BROOKS.

Red House Observatory, Phelps, N. Y.,
April 17, 1882.

### A Burning Lake.

It is said that from one of the chief naphtha wells of Russia, the liquid shoots up as from a fountain, and has formed a lake four miles long and one and a quarter wide. Its depth is, however, only two feet. This enormous surface of inflammable liquid recently became ignited, and presented an imposing spectacle, the thick black clouds of smoke being lighted up by the lurid glare of the central column of flame, which rose to a great height. The smoke and heat were such as to render a nearer approach than one thousand yards' distance impracticable. Suitable means for extinguishing the fire were not at hand, and it was feared that the conflagration would spread underground in such a manner as to cause an explosion. This supposition led many inhabitants of the immediate vicinity to remove to a safer distance. The quantity of naphtha on fire was estimated at four and a half million cubic feet. The trees and buildings within three miles' distance were covered with thick soot, and this unpleasant deposit appeared on persons' clothes, and even on the food in the adjacent houses. Not only was the naphtha itself burning, but the earth which was saturated with it was also on fire, and ten large establishments, founded at great expense for the development of the trade in the article, were destroyed.

### Largest Gasometer.

The dimensions of the gasholder for South Metropolitan Gas Company, London, Eng., is as follows: Inner lift, 208 feet diameter, by 53 feet 6 inches deep; middle lift, 211 feet diameter, by 53 feet 3 inches; outer lift 214 feet diameter, by 53 feet, thus having a total height of 159 feet 9 inches. This, it is said, is the greatest height and the largest capacity of any gasholder that has ever been made. There is, according to Mr. Rees (*English Mechanic*), another gasholder 220 feet diameter, but has only a height of 90 feet. It has a capacity of 5,500,000 cubic feet. The total weight of standards and body for this gasholder is 1,400 tons.

### Women's Silk Culture Association.

The second annual meeting of the Women's Silk Culture Association was held in Philadelphia, April 18. Among the exhibits was a piece of brocaded satin for a dress pattern to be presented to Mrs. Garfield. Fifty pounds of cocoons, contributed from fourteen States, and yielding fourteen pounds of silk, were used in it. Some silk was also shown, spun by worms fed upon osage orange. Three pounds of the osage orange cocoons are said to yield one pound of silk. In her annual report the president asserted that enough had been accomplished to insure success to the movement inaugurated by the society.

### NEW ELECTRIC LOG.

This apparatus provides for a continuous registration, on board the ship, of the actual distance traveled by her through the water. The distance run is shown on dials


*Fig. 2.*—KELWAY'S ELECTRIC LOG—THE RECORDER.

placed in the captain's cabin and elsewhere; each indication being also announced on a single stroke electric bell within audible distance of the officer on watch. The electric log, which has received favorable attention from the Admiralty, seems calculated to be of service in navigation, scientific speed, trials of vessels, nautical surveying, the testing of various forms of screw propellers, and in naval range finding. The Kelway's electric log screw or rotator, which actuates the electrical portion, is placed in a cylinder below the bottom of the vessel, where, by a passage of the vessel through the water, it rotates in a body of water of uniform pressure or density, thus eliminating, even in the roughest weather, the well-known inaccuracies of ordinary towing logs, which are notably affected by the disturbing influence of the ship's propeller or by surface waves.

Fig. 1 shows the interior of the electric log. At its lower part is a sluice valve bolted to the bottom of the vessel; the sluice valve is shown open and allowing the sea full access to the iron box, D D. This iron box is bolted to the upper flange of sluice valve, and is closed at its top by the metal plate, E, which effectually prevents the ingress of water to the ship's hold. Through the stuffing box, F, in plate, E, passes the metal rod, G, the screw thread on which raises or lowers the metal cage, H H. To the bottom of this cage is affixed the cylinder, having its opening for the passage of water in a fore and aft direction or in a line with the keel of the vessel.

The passage of water through the cylinder causes the screw, R, to rotate with the spindle, L. On this spindle is

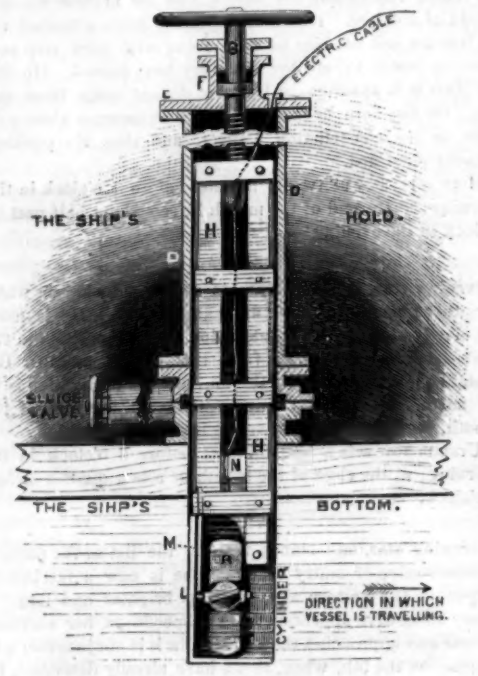



Fig. 1.—KELWAY'S ELECTRIC LOG.

also an endless screw which revolves, by the intervention of a wheel, the vertical spindle, M, which in its turn actuates a series of wheels in the box, N. The last of these wheels, termed the "mile" wheel, makes one revolution while the vessel passes through the water one nautical mile. On the spindle of this "mile" wheel is affixed a second wheel, having eight ratchet teeth; and these teeth, by moving a lever, cause an electric circuit to be completed—obviously eight times in the mile, the current passing through the electric cable to the indicating dials and bells. Referring to the dial, Fig. 2, it will be seen that there are eighty graduations on the outside circle; and, as the pointer in front of the dial jumps one graduation at each completion of the electric circuit, one revolution of the larger pointer represents, ten miles. Ten revolutions of this pointer cause the smaller one to make one revolution, recording one hundred miles. The mechanism of this dial is similar to a gas-meter index.

### The Australian Drought.

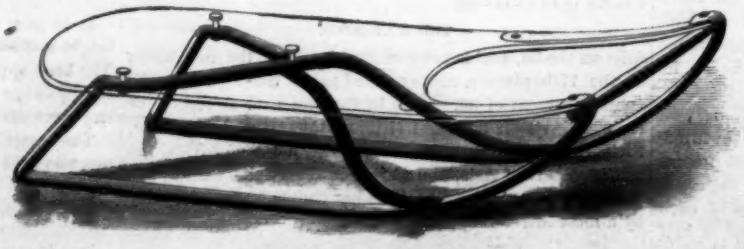
Late mails from Australia report the prevalence of fearful heat and drought. For several months scarcely any rain had fallen, and the heat in the inland districts had been terrific, the mercury once reaching 124° in such shade as was obtainable. Morning after morning, for weeks together, the sun had risen in a cloudless sky and set at night "like a huge red ball of fire at the edge of a copper dome." The losses of station owners are extraordinarily heavy, and the grain harvest will be below the average all over the continent, though in isolated districts the crop is a good one, owing to heavy local rainfalls. In Queensland the drought had broken up, and heavy floods had done much damage; at one station alone two thousand sheep had been drowned by a freshet. It has been said that Australia is a land of contradictions; this, according to the nineteen years' cycle theory, was to be a wet year; thus far, in four of the five colonies, it has been a year of drought.

### A NOVEL SLED.

The engraving shows a new iron sled recently patented by Mr. Asa S. Russell, of Ellenville, N. Y. The novelty in this device consists in a frame made of two bars of iron, each forming a runner. Each bar is attached to the front of the board, and extends thence downward in a curve and passes back, forming the runner. At the back of the sled it is bent and extends upward, at an angle to the board to which it is fastened. It extends thence under the board diagonally across it until it meets and crosses the other bar at the center of the board, where the two are fastened together and to the board; it extends diagonally forward, downward, and outward to the opposite runner, on which its end rests, and to which it is fixed by a bolt.

In the engraving the board of the sled is indicated only in outline to show the form and arrangement of the iron-work more clearly.

This sled is very strong and entirely free from liability to twist and become loose jointed; it is, therefore, more durable than the ordinary sled. As the two parts may be readily bent over a form, the sled may be easily and cheaply made, and as several of the parts which are necessary in ordinary sleds are omitted in this, it may be made very light without impairing its other qualities.



RUSSELL'S IMPROVED SLED.

### License Fees of Officers of Steam Vessels.

The recent act of Congress reducing the license fees of officers of steam vessels was approved by the President, April 5. The new charge for certificates is uniformly fifty cents for all classes. A treasury circular, dated April 11, authorizes inspectors of steam vessels to refund to all masters, engineers, pilots, and mates, licensed on or since April 5, all sums in excess of fifty cents exacted from such officers for their licenses. The form of licenses now in use, indicating grades of officers, will be continued.

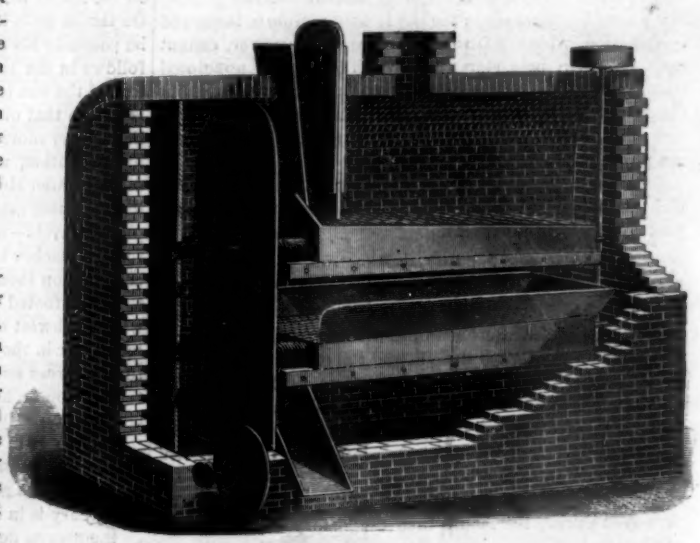
### Tempering by Compression.

The author heats metals, and especially steel, to a cherry red, compresses them strongly, and keeps up the pressure till the mass is perfectly cold. The metal acquires an excessive hardness, and a striking fineness of grain. Steel thus treated acquires a coercitive force, which enables it to become magnetic. The durability of this property requires to be studied.—*M. Clémandot.*

### NEW GRAIN DRIER.

The engraving shows an apparatus by which oats and other grain may be dried by the direct application of the heat from the fire without being injuriously affected by the smoke ascending therefrom. It is so arranged that the grain may be thoroughly dried while passing through it, without requiring any manual labor from the time it enters the machine till it is discharged.

In this drier there are two movable screens, placed one above the other and inclined in opposite directions, so that the grain which is supplied through the spout at the top of the chamber passes toward the rear of the drier on the upper screen and is delivered to the rear end of the lower screen, along which it passes to the discharge spout near the front of the furnace.



BARCLAY'S GRAIN DRIER.

Each screen forms the top of a wind chamber which receives air from a blower at the front of the furnace. The wind passes from these trunks upward through the grain, and the heated air and products of combustion pass upward from the furnace over the grain on the lower screen, thence upward and forward over the top of the upper screen on its way to the flue. The screens are constantly agitated by wipers on the revolving vertical shaft at the rear of the drier

Although the smoke is admitted into the space immediately over the grain it cannot come in contact with it, as the pressure of the heated air escaping through the perforations in the screens prevents so undesirable a result, while the heat from the smoke is fully utilized for the purpose of assisting in drying the grain.

This invention was recently patented by Mr. John Barclay, of Toronto, Canada.

and Jupiter four degrees north of the sunset point. For an

THE OCCULTATION OF JUPITER.

At twenty-four minutes after 7 o'clock, Washington time,

Red House Observatory, Phelps, N. Y.,
April 17, 1882.



### NEW LIFE BOAT PLUG.

From time to time we hear of disasters at sea where the chances for saving life have been greatly lessened by the loss or misplacement of the boat stopper or plug, thus rendering the life boat useless. So important a consideration has this liability to loss of life become, that various contrivances have been invented and adopted, but all seem to have weak points and are more or less liable to get out of order. This device, which is styled by the inventor the "Emergency Life Boat Plug," is the invention of George A. Leavitt, Jr., of Newburg, N. Y., a patent having been recently allowed for it. It is exceedingly simple, very easily worked, and seems entirely trustworthy.

Fig. 1 represents the life boat plug; Fig. 2 is a sectional drawing of plug, showing the details of its construction; Fig. 3 showing its position in boat. On launching boat the cap is screwed down tight on leather washer, thus closing slots and preventing the inflow of water. On raising boat to davits, the cap is unscrewed as far as possible, thus opening slots for the outflow of water. The cap cannot come off, its movement being arrested by the flange in tube coming in contact with shoulder in cap, so there is no danger of loss or misplacement. The plug is made of brass, and is stout enough to withstand any knock or hard treatment that it is liable to receive. The slots are made larger than the actual capacity of tube allowance, being made for partial stoppage by floating matter.

LEAVITT'S LIFE BOAT PLUG.

### Largest Fan in the World.

The ventilating fan at the St. Hilda Colliery, South Shields, is the largest machine of the kind in the world, the diameter of the wheel being fifty feet. The fan can be driven at a speed of fifty revolutions per minute, at which velocity the outer extremities of the blades travel at the rate of a mile and a half a minute—a speed which is estimated to produce a movement of air equal to 200,000 cubic feet per minute. Much of the air moved by this fan must be drawn through over fourteen miles of narrow underground passages.

It is driven by a pair of high pressure engines, each cylinder of which is three feet six inches in diameter, with a three foot six inch stroke. Two completely equipped and perfectly distinct engines are provided for the working of the fan, so that, in the case of a break down on the part of one of them, the other can at once be brought into action.

### NEW ACOUSTIC TELEPHONE.

We give an engraving of an improved acoustic telephone and telephone call signal, patented by Mr. John B. Bennett, of San Luis Obispo, Cal. This instrument may be placed in any desired position, and the line wire may extend in any required direction without making an angle at the instrument, and whichever way the instrument is turned the appearance will be the same. The great difficulty with other string telephones is that they are often incapable of being placed in the most convenient position. The curved speaking tube—which is also used for hearing—terminates flush with the front side of the case, and so constructed that any sound-wave entering its mouth is focused directly on the center of the diaphragm.

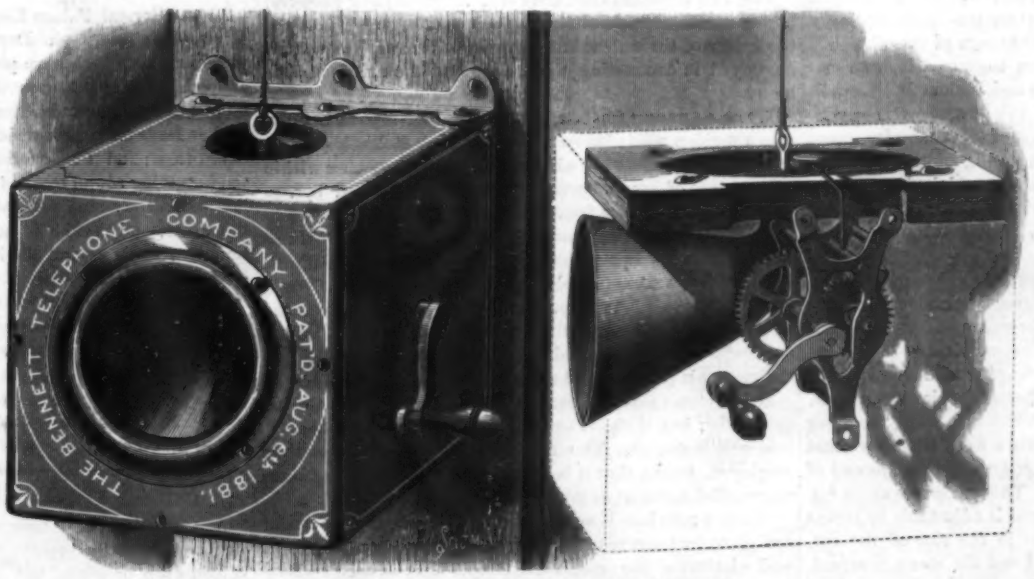
The instruments are furnished with a good and distinct automatic alarm, which is operated by turning a crank on the instrument, the operation being the same as that of operating a magneto bell. Turning the crank causes a hammer to strike rapidly and strongly against an eye in the diaphragm to which the line wire is attached, affording a loud and distinct alarm free from all the bother and expense of electricity. If wished for special purposes, a magneto call can be arranged within the case at slight expense in the place of the automatic call, and can be operated by the same crank.

These instruments are nicely finished, the mouth-piece, crank, and other parts being nickel plated. This telephone, for short distances less than a mile to a mile and a half, works clearly and satisfactorily. The inventor states that he has heard distinctly through a full mile and a half of line.

A new suspender has been devised by the same inventor by which the line is supported without interfering with its sound-conducting qualities. It is also capable of turning angles in the line without material loss of sound.

This telephone has the advantage of great simplicity, and transmits speech naturally and loudly without the application of electricity and without the troubles attendant on its use.

For further information address the inventor as above.




BENNETT'S ACOUSTIC TELEPHONE.

### The Aurora of April 16.

The most brilliant auroral display since 1800 was that of Sunday night, April 16. The accompanying electric storm was uncommonly severe. The chief night operator in the Western Union Telegraph Company's building says that the wires began to be affected shortly after ten o'clock, and in half an hour all the wires, North, South, East, and West, were frequently interrupted. The greatest trouble was on the northern and western routes, but some of the wires on the other routes were also badly affected. The aurora would at one time rob the wires of the usual current, and at another it would so increase it as to render the opening of the wire necessary to keep the instruments from burning. This change was in some cases rapidly made, but in others a wire would be charged from ten to fifteen minutes at a time from the auroral current, which would then forsake it.

From half-past eleven to twelve o'clock, while the electric storm was at its height, it was possible to work with Albany on a wire grounded at each end by means of the auroral current alone. A similar storm, but not as severe, was experienced about a year ago, during which a long special dispatch was sent from Albany on a wire without a battery. At one o'clock, on the Eastern and Southern routes, the wires were working better, but on those running West and North the interruption still continued. The interruption was the most continuous ever experienced. Business on the Atlantic cables was also obstructed. At midnight (Valentia time) messages to the United States were three and a half hours behind time, and messages from this country six hours late. The wires between Chicago and St. Paul, Chicago and Milwaukee, and Chicago and Omaha were worked on the strength of atmospheric electricity without batteries.

### A Deer's Head with Fifty-eight Points.

A head of the white tailed American deer, bearing fifty-eight points, was lately received in this city from San Antonio, Texas. This is three times as many as had been seen before in this part of the country. The deer was shot near the Bandera range of mountains.

### The Sun's Fuel.

What keeps the majestic ball hot and bright? This has greatly engaged physicists and astronomers, and various have been their theories. If the sun shone only by mere combustion of its own materials, the calculation is that its fire would not last five thousand years. It is very kind of Dr. Siemens to come forward with an entirely new theory, which holds out the hope that the men of science are all wrong with their dismal foreboding, and that the creation is not schemed on the poor footing of a German stove or a suburban gas company. The learned ironmaster and physicist believes that the sun may very well go on illuminating and warming our world and the family of sister planets for an indefinite, if not infinite, time. He supposes interstellar space to be filled with an extremely attenuated hydrogen, and interplanetary space with denser gas, albeit more rarefied than the atmosphere drawn round each world. The sun, he thinks, whirling on its axis, draws into its poles the thin hydrogen, hydrocarbon, and oxygen of our sphere, and these, being kindled, are projected outward at his equator into space. The accepted view is that the heat and light there developed and radiated perish, as far as we are concerned, except for the small portion arrested by each solar satellite; but Dr. Siemens argues that this heat and light do their chief work in decomposing the carbonic oxide and watery vapor which were produced by the kindling at the solar poles, so that the sun itself perpetually renews its own supplies, and restores by its energy the waste matter which has fed that energy. The theory is much too technical and complicated to be here discussed, and we should offer a bad compliment to its ingenious author even to attempt such a task. Dr. Siemens, however, has had great experience with the phenomena of radiated heat, and his applications of the new view to the nature of the zodiacal light and of comets is particularly striking. Of course it is startling to hear of something in our own system which closely resembles perpetual motion; and those who maintain that everything comes to an end, and that all mechanical energy must be gradually degraded and metamorphosed, will be slow to receive the new suggestion.—*London Telegraph.*

### Sound, Light, and Heat.

Prof. Tyndall lately delivered the second lecture of his course at the Royal Institution. The explanations given by Huyghens of the phenomena of reflection and refraction, as well as of the properties of convergent and divergent lenses, had, he said, been fully verified by the progress of time and science. The lecturer showed that there are sound lenses also, and that the wave theory affords a no less adequate explanation of their properties. He demonstrated, by the test of the sensitive flame, that cotton net, because porous, transmits waves of sound, while the interposition of a non-porous body leaves the flame unaffected. Just as the passage of light was hindered by clouds, although the air and light of which these are made up were alike transparent, so acoustic clouds obstructed sound. Acoustic clouds consisted of layers of heated air with intermediate layers less heated. The lecturer formed an artificial cloud of the kind, which was shown to intercept sound; the sound was thus thrown back in miniature echoes. Another analogy between light and sound was brought out by comparing the solar spectrum with a scale of notes produced by striking a graduated series of tuning-forks. To illustrate Dr. Wollaston's observation, that certain sounds are inaudible to many ears, Professor Tyndall blew a small whistle, whose low though shrill note instantly agitated the sensitive flame, while full half of those present, as a scientist had predicted in conversation with the lecturer beforehand, heard nothing. Resemblances were also pointed out between the absorption of light and that of sound. On the sound struck from one tuning-fork being quenched, it was proved to have been not annihilated, but simply absorbed by an adjacent fork. In like manner the yellow ray in the solar spectrum was absorbed by sodium vapor as the metal passed under the eyes of the audience into that form, leaving the place of that color in the spectrum marked by a black band.

Professor Tyndall concluded with an eloquent and generous tribute to the memory of his predecessor in the chair of Natural Philosophy at the Royal Institution at the beginning of our century, Dr. Thomas Young, who not only put into Champollion's hands the key to the Egyptian hieroglyphics, but anticipated by a score of years Fresnel and Arago, as was urged in detail, in placing upon its true scientific basis the undulatory theory of light. The lecturer repeated Young's brilliant demonstration of the fact that the prismatic colors of the soap-bubble are in the exact ratio of the

effectually prevents the ingress of water to

RUSSELL'S IMPROVED SLED.

Mr. John Barclay, of Toronto, Canada.



density of the film, ranging from the white light where the cuticle is thickest to the violet ray as it darkens to black just at the bursting point.

### ENGINEERING INVENTIONS.

In driving piling for railroads by a driver moved forward on the piles as the work proceeds it is essential that the piles be dressed and tenoned as rapidly as possible, in order that there be no delay in moving and working the driver. Mr. Andrus L. Gilbert, of Albany, N. Y., has patented an invention, the object of which is to dress the piles by machinery carried on the car of the pile-driver and driven by the same engine, so that the work can be done as fast as the piles are driven, the caps then put on, and the track for the car laid rapidly and with less than the usual expense. The same inventor has also recently invented and patented an improvement on pile-drivers used in the construction of railroads; the invention consists in the arrangement of parts for driving inclined piles. The car will carry an engine for driving the winding-drum, and in operation the car is moved forward to project the platform in front, and then by transverse adjustment of the platform the leaders are brought to place to drive the straight piles in succession. The leaders are then set at the required inclination, and the table turned first to one side and then to the other to drive the inclined piles in line with the straight piles. The work of driving is thus completed as the machine is advanced.

Mr. Christopher C. Bomberger, of Crocker Station, Mo., has patented an improved windmill, in which the wheel revolves in a horizontal plane, and is provided with wings which are kept in a vertical position during half of the revolution, and in a horizontal position during the other half of the revolution by an ingeniously arranged mechanism. The wheel exposes a great vane surface to the wind, and is regulated automatically.

Mr. Thomas Keith, of New York city, has patented an improvement in endless-chain elevators for elevating or lowering and delivering freight on docks and vessels. The object of the invention is to provide for transfer of freight from a vessel to a dock, or the reverse, by arrangements that are practically automatic in their actions. The invention consists in a jointed frame apparatus that can be set to both elevate and convey the freight, so that no handling is required between the vessel and dock.

An improved car-coupling, patented by Mr. Jefferson E. Barrett, of Mount Vernon, Iowa, consists in a draw-head having a U shaped groove in its upper surface, combined with a flat bar sliding in a vertical longitudinal slot in the draw-head, and provided with two lugs. The bar having levers pivoted thereto for raising and lowering it, the free ends of these levers pass through slots in plates provided with locking devices. When the vertically sliding bar is in the lowered position it holds the link in the groove in the draw-head, and it raises the link out of the groove in the draw-head when it is raised by means of the levers or the handle at its upper end.

An improvement in lubricators has been patented by Mr. Henry R. A. Boys, of Barrie, Ontario, Canada. This improvement relates generally to the class of lubricators for engine cylinders operated by condensing steam, a drop of water displacing a similar quantity of oil, which enters the steam-pipe and passes thence to the cylinder. The great advantage secured by the use of this form of lubricator is that the lubrication is carried on continuously, effecting a more perfect lubrication than can be secured in the ordinary lubricator, besides saving a large percentage of the oil.

An improvement in rotary steam engines has been patented by Messrs. George W. Wade and Joshua M. Wardell, of Cadillac, Mich. The object of this invention is to construct a cheap and durable engine and to economize steam in the application of power. The casing of the engine is ellipsoidal, and the rotating piston, which is set centrally in the casing, is provided with radial wings capable of sliding in and out of the piston, to follow the inner surface of the cylinder.

Mr. Leonard Anderson, of Painesville, O., has patented an improvement in locomotive valve-gear, which consists of a vertically fixed lever, pivoted on the main pin, knuckle-pin, or other point on the parallel rods, having pivoted to its head on horizontal horns or pins two forward extending rods, one of which connects by a pin with a perpendicular rocker-arm, to whose lower end is pivoted the valve-rod, while the other forward extending rod connects with a fixed slotted arc that hangs nearly parallel with the rocker-arm, a pin in the end of the rod sliding in the slot of the arc. This pin serves as the fulcrum on which the gear operates, and is adjustable by means of lever and suitable connections in the slot of the arc, whereby the cut-off may be varied and the steam reversed. Motion is transmitted to the gear by a quadrant-lever, fixed on the parallel rods.

### Earthquake at Sea.

Capt. Horner, of the German ship Stella, from Bremen to Baltimore, arriving April 15, reports that on the morning of March 18, in latitude 37° 21′ north, longitude 23° 51′ west, his vessel suddenly halted in her course with a shock that gave to those below the impression that the ship had struck a rock. The weather was clear and the sea smooth and calm. Neither the chief mate, who was on the quarter-deck at the time, nor the look-out, could account for the strange occurrence. The captain ordered the heaving of the lead, but found no bottom at 100 fathoms. The pumps were sounded and the ship found to be tight. The shock lasted only half a minute, after which the ship went on as before. Capt. Horner himself went aloft, but could discover no signs of any obstructions.

## Correspondence.

### Converting Water into Steam Without Heat.

*To the Editor of the Scientific American:*

Reading your remarks concerning the instantaneous expansion of the water at the bursting of the boiler in Mr. Lawson's test, on page 230, it called to mind some experiments at Ballston Spa, N. Y., some few years since, where a lot of boys were trying to make a great noise with a small gun in celebrating one Fourth of July. After using paper wads to but little effect, I suggested water. The gun had a caliber of about 1 inch, and some 12 inches long. We put in 2 ounces of rifle powder, then rammed down a good paper wad, then filled the bore up to within 2 inches of the nozzle with water, then put on another hard wad; the gun being placed on a carriage, which elevated its nozzle about 22 degrees. Fearing explosion, we set a slow match, and ran away. The charge gave a loud report, sending the gun backward and over end some half dozen times. The water burst into vapor like a puff of steam from an engine, when the wind carried it away. This appears a very quick way of getting up steam; whether economical or not I am unable to say.

P. H. WAIT.

Sandy Hill, N. Y., April 17, 1882.

### The Lawson Boiler Experiment.

*To the Editor of the Scientific American:*

In the boiler test by D. T. Lawson, described on page 230, did not the cutting away of the diaphragm and allowing the whole strain of supporting the heads to be sustained by the one inch stay rod, weaken the boiler sufficiently to account for it giving away at the 65 lb. less pressure than it sustained with the diaphragm intact? It so appears to me, as in all probability it was the first point of rupture.

W.

### Ground Air as a Source of Disease.

*To the Editor of the Scientific American:*

In connection with the article, "Cellars as Centers of Malaria," in your valuable paper of January 14, it may interest and benefit many of your readers to state a fact observed by me in Berlin, Prussia, a few years since. It is this: Before building lots are about to pass into hands of intending intelligent occupants, they almost invariably first obtain a specimen of the air contained in the soil at the site of the intended dwelling for analysis, because it has been found that such air invariably fills the cellar, and if unwholesome causes disease. The fact observed by many farmers in this country, that certain cellars are unfit for the storage of meat, however well salted, and milk, is a further proof of necessity to use intelligent care in the selection of a building site.

Deloro, Ont. F. KOERNER.

### Courtship and Marriage among the Choctaws of Mississippi.

BY H. S. HALBERT,

The two thousand Choctaws still living in their ancestral homes in Mississippi, retain, in their pristine vigor, many of the usages of their ancestors. Among these are the methods employed in conducting a courtship and the marriage ceremony.

When a young Choctaw, of Kemper or Neshoba county, sees a maiden who pleases his fancy, he watches his opportunity until he finds her alone. He then approaches within a few yards of her and gently casts a pebble toward her, so that it may fall at her feet. He may have to do this two or three times before he attracts the maiden's attention. If this pebble throwing is agreeable, she soon makes it manifest; if otherwise, a scornful look and a decided "ekwah" indicate that his suit is in vain. Sometimes instead of throwing pebbles the suitor enters the woman's cabin and lays his hat or handkerchief on her bed. This action is interpreted as a desire on his part that she should be the sharer of his couch.

If the man's suit is acceptable the woman permits the hat to remain; but if she is unwilling to become his bride, it is removed instantly. The rejected suitor, in either method employed, knows that it is useless to press his suit, and beats as graceful a retreat as possible.

When a marriage is agreed upon, the lovers appoint a time and place for the ceremony. On the marriage day the friends and relatives of the prospective couple meet at their respective houses or villages, and thence march toward each other. When they arrive near the marriage ground—generally an intermediate space between the two villages—they halt within about a hundred yards of each other. The brothers of the woman then go across to the opposite party and bring forward the man and seat him on a blanket spread upon the marriage ground. The man's sisters then do likewise by going over and bringing forward the woman and seating her by the side of the man. Sometimes, to furnish a little merriment for the occasion, the woman is expected to break loose and run. Of course she is pursued, captured, and brought back. All parties now assemble around the expectant couple. A bag of bread is brought forward by the woman's relatives and deposited near her. In like manner the man's relatives bring forward a bag of meat and deposit it near him. These bags of provisions are lingering symbols of the primitive days when the man was the hunter to provide the household with game, and the woman was to raise corn for the bread and hominy. The man's friends and relatives now begin to throw presents upon the head and shoulders of the woman. These presents are of any kind that the donors choose to give, as articles of clothing, money, trinkets, ribbons, etc. As soon as thrown they are quickly snatched off by the woman's relatives and distributed among themselves. During all this time the couple sit very quietly and demurely, not a word spoken by either. When all the presents have been thrown and distributed, the couple, now man and wife, arise, the provisions from the bags are spread, and, just as in civilized life, the ceremony is rounded off with a festival. The festival over, the company disperse, and the gallant groom conducts his bride to his home, where they enter upon the toils and responsibilities of the future.—*Amer. Naturalist.*

### Tornadoes and How to Avoid Them.

The Signal Service Bureau has in press a monograph, by Sergeant Finley, containing a review of the observations of six hundred tornadoes, with generalizations from the recorded facts and suggestions as to the methods which ought to be followed in the investigation of such storms.

The storm studies have occurred during the past 87 years in all parts of the country. From these it would appear that tornadoes occur most frequently in summer, and in the month of June. They have occurred, however, more frequently in April than in July, and in May and September then in August. Kansas is the State that has been most afflicted, and that notwithstanding the fact that the period during which tornadoes have visited it has been comparatively short. The State has had 62 tornadoes from 1859 to to 1881; Illinois has had 54 from 1854 to 1881; Missouri has had 44 from 1814 to 1881; New York has had 35 from 1831 to 1881; Georgia 33 from 1804 to 1881; Iowa 31 from 1854 to 1881; Ohio 28 from 1823 to 1881, and Indiana 27 from 1852 to 1880. The States and Territories that have had only one each from 1794 to 1881 are: Colorado, California, Indian Territory, Nevada, New Mexico, Montana, Rhode Island, West Virginia, and Wyoming. The storms occur most frequently from five to six in the afternoon, although there is no hour of the day that has been entirely free from them.

The average width of the path of destruction is 1,065 feet, and the storm cloud runs with a velocity of from twelve to sixty miles. The wind within the vortex sometimes attains a velocity of 800 miles an hour, the average velocity being 392 miles.

Among the most valuable suggestions of the paper are those with reference to the peculiarity of the movements of tornado clouds, containing rules for arriving at their violence. A tornado cloud always has a center, and it always moves forward from west to east. It may, however, sway from side to side in its progressive movement. Changes in motion are sometimes very sudden. In the event of a sudden change the observer, who is east or south of east of the storm, should move quickly to the south. If he is northeast he should move to the north. If within a very short distance of the cloud the observer should run east, bearing to the south.

### Woodpeckers and Bears Deceived by Telegraph.

At the Crystal Palace Electrical Exhibition, London, the Norwegian Telegraph Department exhibits two stuffed woodpeckers which have pierced a telegraph pole in search of food. The explanation of this phenomenon, which is by no means uncommon in Norway, is as follows: The woodpecker feeds on insects which it finds under the bark of decayed trees; and it is supposed that the bird is deceived by the humming sound emitted by the telegraph post into the belief that the sound proceeds from the insects concealed in the wood; and that he is not undeceived until the perforation is complete, and daylight, instead of insects, is disclosed to the astonished and disappointed bird. Mr. Nielson, the Chief Director of Telegraphs at Christiania, further states that bears are very troublesome to his department, as they not unfrequently scatter the heaps of stones which are used to support the posts. The bear's fondness for honey is supposed to explain this proceeding; and his operations are performed under the belief that the humming sound proceeds from a bees' nest buried in the earth.

### Castrating Fish.

Attention has lately been called in Germany to an art that used to be secretly practiced in Germany and England by skilled carp breeders, but which seems to have been lost during the present century. It was claimed by experts a hundred years or so ago, that castrated fish were as much superior in flesh to the uncut as the capon is to the ordinary cock, or an ox to a bull. Recalling this practice, a writer in a German fishery paper (translated for the "Bulletin" of the U. S. Fish Commission) says: The nutritious matter which would otherwise have served for forming roe or milt will certainly cause a more rapid increase of flesh and fat, and therefore an equally rapid increase in the weight of the fish. For such experiments young, but full-grown, fish should be selected (perhaps two or three year old trout) whose generative matter has not yet been fully developed (the time for trout would, therefore, be April and May) None should engage in such experiments but those who possess the necessary leisure and knowledge.

### Holland's Climax Hammerless Guns.

Among the more recent and successful competitors for the favor of sportsmen, in the matter of hammerless guns, are those made by Messrs. Holland & Holland, of London. At the recent Sportsmen's Exhibition in that city these guns attracted a good deal of favorable attention and called out many commendations from experts who had given them the practical test of field service. The chief advantage claimed for these guns lies in their freedom from liability to accidental discharge. By a simple and clever device a safety block is always interposed between the hammer and the cap of the cartridge, except when the trigger is pulled, while the trigger is locked by a top safety bolt which may work automatically if desired. The setting out of the locks is so arranged that, in discharging the piece, before the sear can be pulled out of the tumbler-bent, and the hammer allowed to fall upon the striker, the trigger will have lifted the short arm of the safety bar far enough to clear the block out of the way of the falling hammer. In this way there is obtained, when the lock is in good order, an absolute security against accidental discharge, not only when the lock is bolted, but even when placed at full cock ready for firing. It is impossible for the jar given by the explosion of one barrel of a double gun to set off the lock of the other barrel, a matter of no small importance to sportsmen when using heavy charges. The locks are simple in construction, and can be taken off for cleaning or repairing, the same as an ordinary side lock. The pistons which raise the tumblers to full cock are under cover, and fit into circular holes so as to prevent the entrance of water to the lock. The gun is easily opened, yet has a sound and secure connection, having the top lever with a double bolt grip under the barrels, and when desired a third grip at the top—a triplex fastening which stands heavy shooting with large charges without any loosening or gaping of the action. A widely known contributor to the London *Field* ("Wildfowler"), who has used one of the Climax sporting guns for the last two years, firing about five thousand shots with it, says that he has never had a misfire or the slightest hitch with it. He describes it as one of the hardest hitting guns he has ever used.

Among the guns shown at the Sportsmen's Exhibition by this firm were some specially adapted for pigeon shooting. They were arranged with extra top grip, bare seven and a half pounds weight, to shoot four drachms powder and one and a quarter ounce shot, chambered to the three inch shell. The barrels are from English steel, Damascus, or from Whitworth fluid steel; choke bore. The duck guns shown were of three sizes; ten bore, chambered to take full length 'shell, and to shoot up to five and a half drachms powder; warranted to give good pattern and penetration at eighty yards; eight bore, shooting up to seven drachms; and four bore singles, thirteen to fifteen pounds, shooting ten drachms, and warranted to kill up to one hundred and fifty yards.

### New York City Refuse.

A bill passed by the House of Representatives, April 10, makes it a misdemeanor, punishable by fine and imprisonment, to deposit ballast, street-sweepings, garbage, or other refuse in any of the navigable waters in or around New York Harbor. Such stuff, if dumped into the water, must be carried at least five miles out to sea.

The rule is a good and necessary one, and if properly carried out will put a stop to practices which are rapidly filling up the channels, and which, in summer, create grievous nuisances along the shores of the harbor and adjacent waters.

Another effect will be to bring into prominence and increase the demand for processes for destroying or utilizing street-sweepings, garbage, and similar refuse. It seems a pity to cast such materials into the sea, for they are rich in elements drawn from the soil, and which by good rights ought to go back to it.

The prohibition of dumping inshore will also make an immediate demand for self-dumping sea-going scows or boats capable of running five miles out to sea in all sorts of weather. A very promising device of this sort was publicly tested a few days ago, in an improved form of the Barney self-dumping boat. A smaller boat on the same general plan, tried last year, failed to operate satisfactorily. The new boat is 110 feet long, 28 feet wide, and when loaded draws 9½ feet of water; she can carry 500 tons, has sharp bows and a rounded stern, and can, it is said, go out to sea with perfect safety in the severest weather. Her hull consists of two parts called pontoons, extending her entire length, hung at both ends and in the middle to heavy bridges, working upon hinges at the sides. The carrying space is between the pontoons, the interior surfaces of which, when in their fixed position, slope inward toward the keel, where they meet, forming a hold which has the shape of the letter V. It is 86 feet long. The confined space within the pontoons—not between them—serves to make them so buoyant that, when the vessel is empty, their position is naturally a closed one. They are locked together before loading, and are not unlocked until the dumping ground is reached. When this is done the load forces the pontoons apart at the bottom and it drops into the water. The pontoons are held in this position by the hand on the wheel. When that is relaxed their buoyancy brings them back together and they are relocked. The owners of the improved scow claim that it will save $60,000 per year to the city if adopted.

At the trial the process of dumping and closing the scow is said to have taken ten minutes.

### Relation of Fires to the Weather.

A recent issue of the *Chronicle* discusses from an insurance point of view the probable influence of atmospheric conditions upon fire losses, the main factor considered being humidity. The discussion, which is a very suggestive, not to say important one, is not confined to the generally recognized increase in local fires during specially protracted seasons of dry weather, but seeks rather to discover the broader relations of general rainfall throughout the United States, and the observed fluctuations in the aggregate fire losses, year by year and month by month "Assuming that the human hazard is a constant, and that the difference of states in respect to architecture and industry has been reduced by the law of average also to a constant, what is left to explain the increased or diminished aggregate fire loss of one year over previous years unless it be some meteorological peculiarity?"

Taking the statement of the precipitation, month by month, during the year ending with June, 1879, compared with the average for several previous years, as given in the last published report of the Chief Signal Officer of the United States, and using it as a basis of comparison with the fire losses for the corresponding months as contrasted with the average losses in the same month of the two previous years, the *Chronicle* finds that an excess of humidity is steadily followed by a decrease in the fire loss, and a deficiency by a corresponding increase in the fire loss.

The same relation between rainfall and fire loss is strongly indicated in tables showing the periods of greatest and least fire loss in California, where the contrast between the wet and the dry season is so sharply drawn. Notwithstanding the fact that the wet months cover the season—the California winter—when domestic fires are most employed, thereby increasing the relative fire hazard, the monthly mean of fire loss for the wet season is only about half that of the dry season.

From these and other tests the *Chronicle* deduces the following conclusions:

(1) That there is an interdependence between the humidity and the fire loss; (2) that whatever affects the rainfall, such as the destruction of forests, etc., will affect the fire loss; (3) that there is a factor in the shape of an atmospheric hazard that should enter into the underwriter's calculations quite as well as the other elements of "moral" hazard, etc.; (4) that there are localities peculiarly adapted by meteorological conditions to a high ratio of fire loss; (5) that this natural hazard should determine, as nearly as practicable, the architecture of such localities, their means of fire protection, and the proper rate of premium for risks there written.

### Early Developed Power to Command.

The following list of great generals whose superior capacity was exhibited in early manhood, was compiled by the late Brevet Major-General Emory Upton:

Philip of Macedon ascended the throne at twenty-two, was the conqueror of Greece at forty-five, and died at forty-seven.

Alexander the Great defeated the celebrated Theban band at Cheronea before arriving at the age of eighteen, ascended the throne at twenty, had conquered the world at twenty-five, and died at thirty-two.

Julius Cæsar commanded a fleet before Mitylene and distinguished himself before the age of twenty-two; completed his first war in Spain and was made consul before the age of forty; conquered Gaul, twice crossed the Rhine, and twice invaded Britain before the age of forty-five; won the battle of Pharsalia and obtained supreme power at fifty-two. He died at fifty-six, the victor of five hundred battles and the conquerer of one thousand cities.

Hannibal was made commander-in-chief of the Carthaginian army in Spain at twenty-six, and had won all his great battles in Italy, concluding with Cannæ, at thirty-one.

Scipio Africanus, the elder, distinguished himself at the battle of Ticinus at sixteen, and at twenty-nine overthrew the power of Carthage at Zama.

Scipio Africanus, the younger, had conquered the other Carthaginian armies and completed the destruction of Carthage at thirty-six.

Genghis-Khan achieved many of his victories and became emperor of the Monguls at forty.

Charlemagne was crowned king at twenty-six, was master of France and the larger part of Germany at twenty-nine, placed on his head the iron crown of Italy at thirty-two, and conquered Spain at thirty-six.

Gonsalvo de Cordova, the great captain, had gained a great reputation and was made commander-in-chief of the army of Italy at forty-one.

Henry IV., of France, was at the head of the Huguenot army at sixteen, became King of Navarre at nineteen, overthrew his enemies and became King of France before the age of forty.

Montecuculi, at the age of thirty-one, with 2,000 horse, attacked 10,000 Swedes and captured all their baggage and artillery; gained the victory of Triebel at thirty-two; defeated the Swedes and saved Denmark at forty-nine; and at fifty-three defeated the Turks in the battle of St. Gothard.

Saxe was a *maréchal-de-camp* at twenty-four, marshal of France at forty-four, and at forty-nine gained the famous victory at Fontenoy.

Vauban, the great engineer, had conducted several sieges at twenty-five, was *maréchal-de-camp* at forty-three, and *commissaire-général* of fortifications of France at forty-five.

Turenne, passing through the grades of captain, colonel, major-general, and lieutenant-general, became a marshal of France at thirty-two, and won all his distinction before forty.

The great Condé defeated the Spaniards at Rocroi at twenty-two, and won all his military fame before the age of twenty-five.

Prince Eugene, of Savoy, was colonel at twenty-one, lieutenant-field-marshal at twenty-four, and shortly after general-field-marshal. He gained the battle of Zenta at thirty-four, and co-operated with Marlborough at Blenheim at forty-one.

Peter the Great, of Russia, was proclaimed Czar at ten years of age, organized a large army at twenty, won the victory of Embach at thirty, founded St. Petersburg at thirty-one, and died at the age of fifty-five.

Charles XII. completed his first campaign against Denmark at eighteen, overthrew 80,000 Russians at Narva before nineteen, conquered Poland and Saxony at twenty-four, and died at thirty-six.

Frederick the Great ascended the throne at twenty-eight, terminated the first Silesian war at thirty, and the second at thirty-three. Ten years later, with a population of but 5,000,000, he triumphed over a league of more than 100,000,000 of people.

Cortes effected the conquest of Mexico and completed his military career before the age of thirty-six.

Pizarro completed the conquest of Peru at thirty-five, and died at forty.

Lord Clive distinguished himself at twenty-two, attained his greatest fame at thirty-five, and died at fifty.

Wolfe was conqueror of Quebec at thirty-two.

Napoleon was a major at twenty-four, general of brigade at twenty-five, and commander-in-chief of the army of Italy at twenty-six; achieved all his victories and was finally overthrown before the age of forty-four.

### MECHANICAL INVENTIONS.

An improvement in machinery for untwisting and carding curled horse hair has been patented by Mr. Thomas Adcock, of Adelaide, South Australia. The object of this invention is to untwist ropes of horse hair and to card the hair by a continuous operation in one machine. This machine will perform the work much more rapidly and better than it can be done by hand. One, two, or more untwisters may be used as desired, and the machine driven by hand or other power.

A novel motor has been patented by Mr. Samuel N. Silver, of Auburn, Me. The invention consists of one or more sliding and reciprocating cylinders, containing pistons held in these cylinders by latches, which pistons are each adapted to slide on a central rod surrounded by a coil spring, to which pistons rocking arms are pivoted, which are loosely mounted on a shaft, these arms being provided with pawls or other suitable clutching devices for rotating the shaft. When the cylinders are pressed downward the springs are brought in tension, and when the springs exert the power stored in them they rotate the shaft.

An improvement in rolling mills has been patented by Mr. Wilhelm Wenstrom, of Orebro, Sweden. This invention relates to that class of rolling mills in which one pair of horizontal and one pair of vertical rolls are arranged to roll metal simultaneously upon four sides, and are made adjustable with relation to each other. The object of this invention is to give the rolls an exact and steady motion under all circumstances, and to secure a compactness of construction and arrangement by which the bearings are adapted to withstand the required pressure without straining or displacement.

Mr. George A. White, of Halifax, Nova Scotia, has patented an improvement in circular knitting machines for the manufacture of tubular fabrics, particularly the class of hand machines using double sets of needles for forming ribbed fabrics. The object of this invention is to render such machines more perfect in operation, and thus produce better fabrics with less labor and attention in the operation of the machine. The novel features consist particularly in the fender or latch opener and the cams for moving the needles.

### A Good Suggestion.

The *Avalanche*, of Memphis, Tenn., contains a suggestion, made by a resident of that city, which is well worth carrying out. He would have in every stateroom on a steamer an electric bell connected with both the pilot house and the clerk's office. In case of threatened disaster the prompt awakening of all the passengers might save many lives. As the *Avalanche* says, a sudden alarm to rouse all the sleeping passengers at once on the first discovery that the steamer is on fire would give the passengers a chance for their lives. There is always more or less dangerous delay when a messenger undertakes to awaken the sleepers by knocking on the cabin doors, and there is the risk of the messenger looking out for his own safety instead of the safety of the passengers. People who travel are canvassing their chances to escape in case of fire, and it would be well for owners of steamers to provide all measures within their power to secure safety for their passengers. The same precautionary plan of simultaneously and suddenly awakening the sleeping guests of a hotel could also save precious time in case of fire.

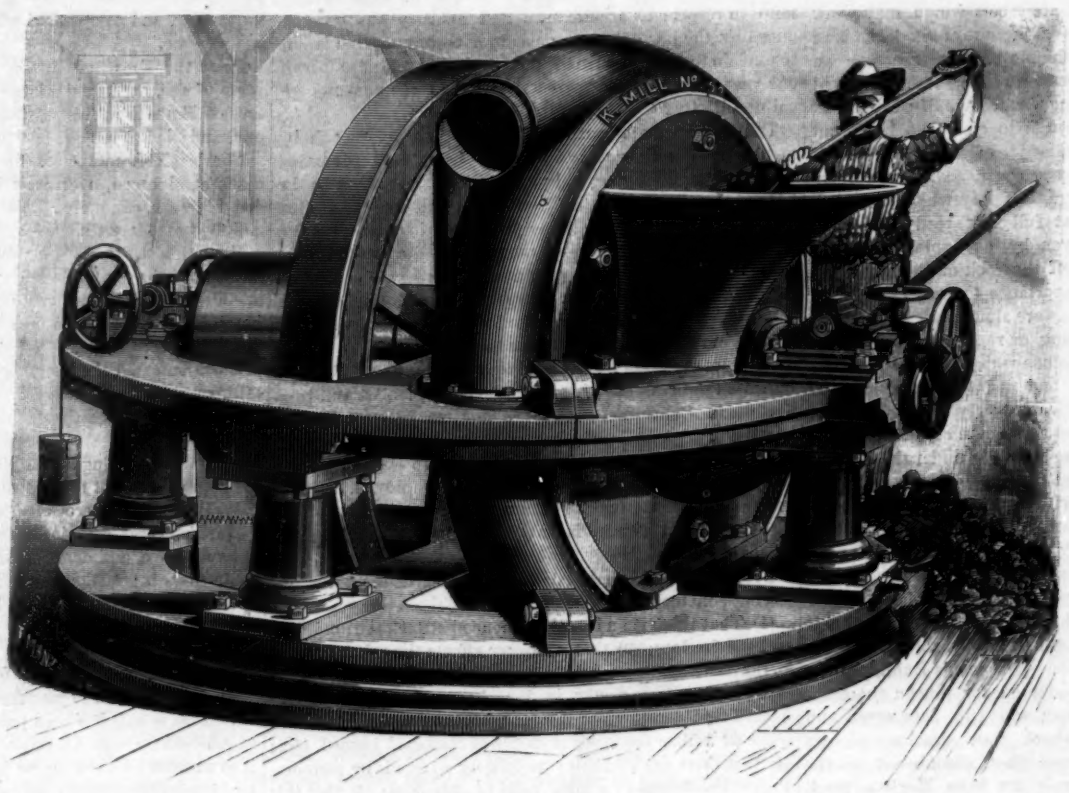
## A NEW ORE MILL.

We give two engravings of a new and powerful grinding mill made by the Northwestern Fertilizing Company, Chicago, Ill., for grinding all hard substances, such as rock, iron ore, gold ore, cement, etc.

The advantages claimed for the mill are its great simplicity, its economy in grinding, a large capacity for work, and the complete adaptation of the mill to any class of grinding required. It is adjusted to any grade, either fine or coarse, by means of a simple set screw.

By a novel mechanical device, when large pieces of iron enter the mill the grinding faces open five inches and the iron is thrown out without any injury to the mill. The manufacturers inform us that its capacity for grinding rock to a sixty mesh screen is one ton per hour, twenty tons in twenty hours. The grinding faces are made of metal that resists the wear, but the chief advantage is in the construction of the mill which makes the rock pulverize itself rather than by rubbing against the grinding faces. This is accomplished almost entirely by centrifugal action. The cost of repairs is very light, the grinding faces being capable of running three months on rock without renewal.

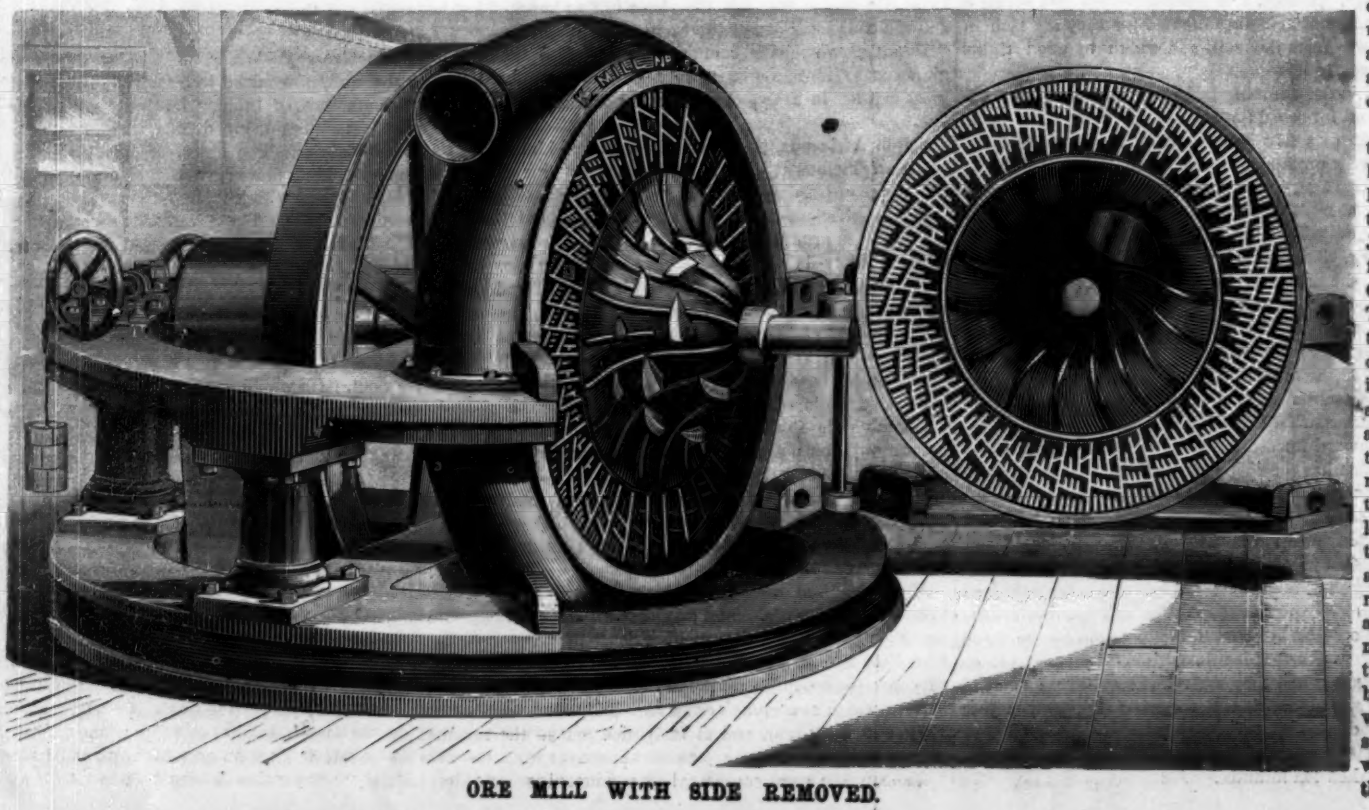
It requires about twenty-five horse power to run the mill to its full capacity. No foundation is required, neither are bolts needed to hold the mill to place, its weight, which is 23,000 lb., being sufficient to hold it. When in position it is noiseless. It does its own crushing, and no preparation of the rock is required. The smaller engraving shows the mill closed ready for work. The larger one shows the mill open, with grinding faces exposed. The manufacturers have been running this mill on rock for the past eighteen months, and they claim that the mill is unrivaled for capacity and economy in reducing gold, iron, or other ores to powder. They have recently pulverized iron ore with it, at the rate of one ton per hour, to a degree of fineness that would permit it to pass through a sixty mesh screen.



NEW ORE MILL.

## "Cutting the Key Log."

The first thing to be done is to find out where the jam occurred, and then to discover what is called the "key log," that is to say, the log which holds the base of the "jam." An old experienced "stream driver" is soon on the spot, for the news is soon carried up stream that there is a "jam" below. Every minute is of consequence, as logs are coming down and the "jam" increasing in strength. The "key log" being found, there is a cry for volunteers to cut it. Now, when you consider that there are some hundred big logs of timber forming a dam, and the instant the key log is cut the whole fabric comes rushingdown with a crush, you will see that unless the ax-man gets instantly away he is crushed to death. There are usually in a camp plenty of men ready to volunteer; for a man who cuts a key log is looked upon by the rest of the loggers just as a soldier is by his regiment when he has done any act of bravery. The man I saw cut away a log which brought down the whole jam of logs was a quiet young fellow, some twenty years of age. He stripped everything save his drawers; a strong rope was placed under his arms, and a gang of smart young fellows held the end. The man shook hands with his comrades, and quietly walked out on the logs, ax in hand. I do not know how the loggy-road one felt, but I shall never forget my feelings. The man was quietly walking to what very likely might be his death. At any moment the jam might break of its own accord, and also, if he cut the key log, unless he instantly got out of the way, he would be crushed by the falling timber. There was a dead silence while the keen ax was dropped with force and skill on the pine log. Now the notch was near half through the log, one or two more blows, and a crack was heard. The men got in all the slack of the rope that held the ax-man; one more blow and there was a crash like thunder, and down came the wall of timber, to all appearances on the ax-man. Like many others, I rushed to help haul away the poor fellow, but to my great joy I saw him safe on the bank, certainly sadly bruised and bleeding from sundry wounds, but safe.—*The Field.*



ORE MILL WITH SIDE REMOVED.

## MISCELLANEOUS INVENTIONS.

A novel folding bed has been patented by Mr. Charles M. Morrison, of New York city. This invention relates to that class of folding beds which are hinged in the middle, the parts folding toward each other and having the appearance of a desk or *chiffonnier* when folded. The object of the invention is to balance the bedstead without the use of counter-weights, and to permit of making the legs of less height than one-half of the length of the hinged sections forming the bedstead.

Mr. Alfred Michaud, of Paris, France, has patented an improved permanent galvanic vat. By this improvement the expense necessary for setting up the apparatus and maintaining it in working order is greatly reduced, the purity of the galvanic liquids is maintained, the galvanic action is regular and uninterrupted and its energy is increased, the manipulation is simplified, and, it is claimed, an economy of at least fifty per cent of the salts ordinarily employed is effected. The principal feature of the invention consists in a feeding device for supplying new fluids continuously, and in a siphon arrangement for removing the spent liquid.

Mr. Joseph Fournier, Jr., of New York city, has patented an improved folding cabinet bed that may be raised or tipped upon one of its edges, so as to stand in a vertical position against the wall when not in use. When in a horizontal position for use the bedstead is supported upon leaves hinged to the ends of the bedstead, and these leaves are adapted to be closed or folded in, like doors, against the bottom of the bedstead, so as to give the bedstead the appearance of a wardrobe or cabinet when tipped upon its edge.

An improvement in boxes, patented by Mr. Charles Beiser, of Toledo, O., consists in a box provided with a two-part or divided slip lid, and in elastic connections of the divided lid with the body of the box, and of the lid sections with each other, whereby the lid sections are attached to the body and are automatically opened when the elastic connection uniting them is released.

An improved straw-conveyer belt has been patented by Mr. Alton J. Park, Jr., of Virginia, Mo. The object of this invention is to prevent the straw from catching in between the ends of the slats and the conveyer belt, and to secure the ends of the slats more effectually to the belt.

Mr. Edward E. Schermerhorn, of New York city, has patented a new and improved milling attachment for vises. The object of this invention is to furnish a handy, efficient, and labor-saving tool for the shop, for doing the work by hand that is usually done with files. It consists in a milling tool carried by adjustable devices, by which it may be attached to a vise or directly to the work.

Mr. John Brush, of Albany, Oregon, has patented an improved grain separator for separating oats from wheat or other grain and for removing chaff from wheat or other grain. In this machine all of the sieves are easily inserted and removed, and the machine is readily adjusted for different kinds of work. It runs lightly, and is easily and cheaply constructed.

A whip attachment for horse powers has been patented by Mr. J. L. Crawford of Pine Grove, Miss. This invention consists of a rod having a crank at one end and a whip at the other, the rod being attached to the lever to which the horses are attached, the rod being adapted to be moved longitudinally to bring the whip into position for whipping either horse.

## THE TILE FISH.

BY DANIEL C. BEARD.

How little is really known, even by our most learned scientists of that wonderful country that lies hidden beneath the waves! What we know of its geography, aside from the summits of the mountains and highlands that are high enough to rear their heads into our world of air, is barely sufficient to mark out safe routes for vessels from point to point. Of the creatures that dwell in this unknown region our knowledge is limited to such specimens as accident may cast up, or the fisher's net gather along its outer edge, or the dredge of the scientific explorer capture in its depths.

We can scarcely imagine creatures more hideously monstrous or more wonderfully beautiful than some of the known denizens of this immense world of the sea! For aught we know to the contrary the great sea-serpent may yet prove to be a living reality, for has there not been within the last few years discovered, captured, classified, measured, and publicly exhibited a sea monster as horribly strange and terrible as the fiery dragon of fairy tale? What was once called the fabulous devil-fish is now known to every school boy as the giant squid.

The discovery of a new and strange food fish need, then, be no surprising matter. Some three years since a Yankee fisherman caught a number of fish whose odd triangular crest, or adipose fin on the nape of their neck, at once marked them as strangers, and created a stir among *savants* and naturalists; but if they were surprised at this sudden appearance of a new fish, they were more surprised and puzzled last month when the commanders of two vessels brought in reports of sailing through miles of dead carcasses of this newly-discovered fish, the *Lopholatilus chamæleonticeps*, or tile fish. Whence these mysterious strangers came, or what caused their wholesale slaughter, are questions we know not how to answer, but of the facts we have sufficient proof.

THE TILE FISH.

A specimen of the tile fish that was sent to the U. S. National Museum measured thirty-three inches in length; the illustration accompanying this article was drawn from the Washington specimen.

We first hear of the "tile fish" from the report of Capt. William H. Kirby, of Gloucester, Mass., who took five hundred pounds of a remarkable fish, new to both fishermen and scientists, and forming a type of a new genus and species. These fish were caught on a codfish trawl eighty miles S. by E. of Noman's Land, lat. 40° N., long. 70° W., in eighty-four fathoms of water. According to Capt. Kirby the largest fish weighed fifty pounds.

We next learn of this fish from Capt Wm. Dempsey, also of Gloucester, Mass., who, in July, 1879, caught some with menhaden bait at a point fifty miles S. by E. of Noman's Land, in seventy-five fathoms of water, bottom hard clay; two miles inside there is nothing but a "green ooze on which no fish will live." Capt. Dempsey gives the following particulars of this *lopholatilus*: "Liver small, somewhat like that of a mackerel, and contains no oil. Flesh oily, and soon rusts after splitting and drying. The stomach and intestines are small, the latter resembling those of an eel. The swim bladder is similar to that of the cod, and he adds that "the fish were very abundant and but freely." The largest fish caught by Capt. Dempsey had a bifid nucleal crest.

Some of the first tile fish that were brought into Gloucester were sent by Prof. Baird to Fish Commissioner Blackford, of Fulton Market. These fish were cooked and served at the Windsor, and their qualities as a food-fish tested by Mr. Phillips, secretary Fish Culturist Society; Mr. John Foord, president of the Ichthyophagous Club, and Mr. Blackford. We next hear of this mysterious denizen of the deep from several of the daily papers. In their issue of the 28d of March, there appeared accounts of immense numbers of dead fish that were seen by people aboard vessels that passed the southern end of St. George's Bank, Newfoundland. On the 3d of last month Capt. Henry Lawrence, of the bark Plymouth, from Antwerp, and Capt. George Coalfleet, of the bark Dunkirk, witnessed this phenomenon.

When a drawing of the *lopholatilus* was shown by Mr. Blackford to several of the sailors of the above named vessels they at once declared it to be a drawing of the same fish whose dead bodies had so astonished them off "The Banks." These sailors had cooked and eaten some of the dead fish. The meat was fresh and hard, and according to their account very good eating.

The following technical description of this fish is from Washington:

*Radial Formula.*—B. VI.; D. VII. 15; A. III., 13; C. 18; P. II., 15; VI., 5; L. Lat. 93 L. Trans. 8 + 30.

*Color.*—"The operculum, preoperculum, upper surface of head, and major portion of body have numerous greenish-yellow spots, the largest of which are about one third as long as the eye. Upon the caudal rays are about eight stripes of the same color, some of them connected by cross blotches. The upper part of the body has a violaceous tint, and the lower parts are whitish, with some areas of yellow. The anal and ventral fins are whitish; the pectorals have the tint of the upper surface of the body, with some yellow upon their posterior surfaces; the soft dorsal has an upper broad band of violaceous and a narrow basal portion of whitish. Many of the rays have upon them a yellow stripe; there are some spots of the same color, especially upon the anterior portion of the fin.

"The species appears to be generically distinct from the already described species of the family Latilidæ, Gill. It is related by its few rayed vertical fins and other characters to the genus Latilus, as restricted by Gill, but is distinguished by the presence of a large adipose appendage upon the nape resembling the adipose fin of the Salmonidæ, and by a fleshy prolongation upon each side of the labial fold extending backward beyond the angle of the mouth. For this genus we propose the name *Lophotilus*" (G. Brown Goode and Tarleton H. Bean, "Proceeding of U. S. National Museum.")

### Fish Fodder for Cows.

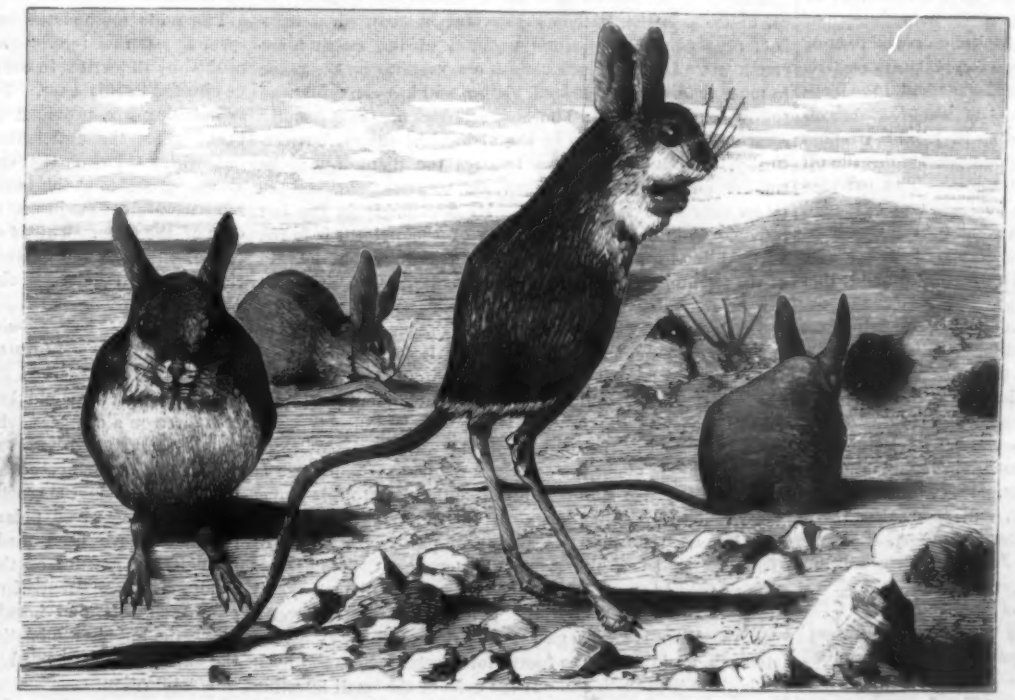
Travelers in the country about North Cape, Norway, are apt to be amazed to see the natives eking out the scanty fodder for their cattle by giving their cows rations of dried fish. According to Captain Atwood, of Provincetown, Mass., the Cape Cod cows used to do better—or worse—and feed heartily upon raw fish. According to a statement by him, communicated to the Fish Commission by Isaac Hinckley, and printed in the *Bulletin*, the Provincetown cows being "kept up" have lost the fish-eating practice; but prior to the passage of the Massachusetts statute forbidding owners of cows to allow them to roam at will (which statute was enacted to protect directly the beach grass which checked the drifting of sand), the cows flocked to the shore while the fishermen were cleaning their catch. These cows sought with avidity the entrails and swallowed them. They seemed willing to eat the heads also, but lacked the ability to reduce their bulk sufficiently to allow of this.

A species of ling or blenny, weighing three pounds or more, and discarded by the fishermen, was freely eaten also by the cows.

Cows when first arriving at Provincetown from the rural districts refused fish; but their owners, by adding minced fish to their cows' rations, soon taught the cows to imitate their neighbors in respect to eating entrails.

### JERBOAS, OR LEAPING MICE.

The jerboa is a small rodent, or gnawer, with very long hind legs and diminutive fore ones, and is the principal representative in the Old World of the rodent sub-family *dipodenæ*. Its general form and habits have some striking resemblance to a bird's. His body, like that of a bird, is supported on two long legs, and, in both, the length of the leg is caused by the excessive prolongation of that part of the foot called the tarsus or metatarsus, so that, when standing, the heel is elevated much above the ground. The bones of the metatarsus, which are normally fine among the vertebrata, are, in this instance, reduced to three, and occasionally even to one single bone in that part of the foot that extends from the heel to the toes. The folded fore legs of the jerboas are as unnoticeable as the folded wings of a bird, and its skull is large and spare, like that of many birds.



JERBOAS, OR LEAPING MICE.

These resemblances might be greatly increased, but though they are very curious they are merely accidental, and do not at all prove that the jerboas are related to the bird family.

The jerboa has a large head, ending in a little muzzle, long moustaches, enormous soft black eyes, and long sharp ears. His tail is long and cylindrical, enlarged at the end, so that it can be used, like the kangaroo's, to support the body while jumping, and has a little tuft of black hairs tipped with white. The foot is protected under the toes by elastic cushions of flesh covered with stiff bristles. The body is generally about the size of a rat, but in one species found in Middle Africa, the *Pedetes cafer*, or jumping hare, the body is as large as a rabbit. The fur is soft and fine, a charming fawn color above and underneath a brilliant white.

These little animals belong almost exclusively to the Old World, and are found in the deserts of Africa, Asia, and Eastern Europe. One single species is known in America as the *Jaculus hudsonian*, or jumping mouse, as it is popularly called. It is found as far north as latitude 61°; its body is about five inches in length, its tail a little longer, ending

in a hairy tuft, its color is reddish brown, shading into white beneath the body.

There are two species found in Algeria; the Egyptian is the most common, and is represented in our illustration; the other species, the "Dipus hertipes," is rare, and inhabits the extreme southern part of the desert of Sahara; it is smaller, and its fur is more fine and white than the former species, the Egyptian jerboa, which may be taken as a type of this whole family. Its ears are two-thirds as long as its head; its stiff moustaches and the tufts of hair on its tail are brown at the base and white at the tip.

They live in colonies, and dig deep, far-spreading burrows in the ground

The Arabs catch them by digging into the burrows, in order to eat their flesh, which is considered a great delicacy.

They are very timid animals, and it is only possible to catch them at that season of the year when the female bears her young. At that time, like the rabbits and other burrowing animals, she leaves the common burrows, and digs a new, isolated one for herself, where she can make her nest out of old rags or leaves.

Even in captivity, the jerboa loves to construct a sort of bed for itself, on which it passes hours at a time, rolled up in a ball, or stretched out at full length on its back, like a human being. It is so skillful in unraveling anything with its claws and teeth, that in a short time it will make a downy mattress from an old rope or bit of muslin. It will gnaw through any kind of wood, and frequently will make a hole even in a stone wall, by scratching it with its sharp claws. It finds a double satisfaction in this work, for, besides gratifying its destructive instincts, it makes a pile of dust in which it loves to roll and jump about.

In spite of these habits they make very pleasant pets; they are bright and lively, perfectly gentle, and very affectionate. But they are delicate, and it is difficult to keep them alive even in warm climates.

They are clean and intelligent. "Of all the rodents I have had in captivity," writes Brochm, "the jerboas have given me the most pleasure. They have so many good qualities that all are delighted with them. They are so inoffensive, so gentle, and so gay, their poses are so varied and so curious, that I have spent long hours observing and playing with it."

The jerboa moves very rapidly, and in its native deserts even those swift dogs, the songhis, that catch the hare and the gazelle, cannot overtake it. It escapes pursuit as much by the irregularity of its course as by its quickness.

The dog jumps on it, and it suddenly springs to one side, and before the dog can recover, is already a dozen miles away to the right or left.

In all circumstances, whether springing or peacefully walking, the jerboa only uses its two strong hind legs; the fore legs are folded under its chin, and cannot be distinguished without careful observation. They are only used to convey its food to the mouth.—*La Nature.*

### The Origin of the Menhaden Industry.

Captain E. T. Deblois, of Portsmouth, R. I., has written for the Bulletin of the United States Fish Commission an account of the origin of the Menhaden industry, which, according to Professor Goode, throws new light upon several mooted questions, especially the date of the discovery of the value of menhaden oil, the origin of the manufacture of the oil, the application of pressure in the manufacture of fish oil and the invention of the purse seine. Captain Deblois says that as early as 1811 Christopher Barker and John Tallman began to make menhaden oil by the use of two iron pots upon the shore near Portsmouth, R. I. They boiled the fish, bailed them into hogsheads, and pressed out the oil by means of boards weighted with stones. The barreled oil was shipped to New York. The business was extended in 1814, and that fall two other men went into the business near by. These modest works were destroyed by a severe storm in 1815, and were not restored until 1818 or about that time.

In 1824 Mr. Barker built for use in cooking the fish a box 5½ feet high, 6 feet wide, and 8 feet long, with a fire box at one end and a flue running through the box.

Tallman built the first factory in which the fish were cooked by steam in wooden tanks some time before 1841, at which time the second was built on McGay's Point, near Portsmouth. The next year Tallman, in company with George Lambert, of East Cambridge, Mass., built a factory at the mouth of the Merrimac River, and soon after David Wells built one on the same plan near Greenport, N. Y.

John Tallman (the first), with Jonathan Brownell and Christopher Barker, built the first purse seine in 1826. It was 284 meshes deep and 65 fathoms long.

Charles Tuthil, of Greenport, was "the first to express" fish. The method of applying the pressure is not described.

### Fish and "Meat" as Food.

There is some danger, says the *Lancet*, of the fish question falling out of memory. This is not to be tolerated after the interest which has been excited, and for some time maintained, in connection with this important phase of the food problem. Whatever may be the nutritious value of fish as food—and we believe that to be very great—it must be evident that a full and cheap supply of fish would react so as to produce a lowering of the price of butcher's meat. The "purveyors," as they like to be called, are encouraged, and, in truth, enabled, to keep up the price of flesh because there is nothing to compete with it as a staple of the common food of the people. A revival of the old and healthy habit of living largely on fish would place the meat supply on an entirely new footing. This is manifest on the face of the facts; but what may not be equally apparent, though it is scarcely less noteworthy, is the consideration that nervous diseases and weaknesses increase in a country as the population comes to live on the flesh of the warm-blooded animals. This is a point to which attention has not been adequately directed. "Meat"—using that term in its popular sense—is highly stimulating, and supplies proportionally more exciting than actually nourishing pabulum to the nervous system. The meat eater lives at high pressure, and is, or ought to be, a peculiarly active organism, like a predatory animal, always on the alert, walking rapidly, and consuming large quantities of oxygen, which are imperatively necessary for the safe disposal of his disassimilated material. In practice we find that the meat eater does not live up to the level of his food, and as a consequence he cannot, or does not, take in enough oxygen to satisfy the exigencies of his mode of life. Thereupon follow many, if not most, of the ills to which highly civilized and luxurious meat-eating classes are liable. This is a physiological view of the food question, and it has bearings on the question of fish supply which ought not to be neglected.

### The Assimilation of Fat.

Most physiological text books teach that the fat of the body is not derived directly from the fat of the food. But from statistical analysis Hoffmann has arrived at the conclusion that the formed fat of the animal body arises not only from heterologous elements of the food, but also in part at least from ingested fat. Radzcejewsky concludes that the special destination of this fat is the intramuscular adipose tissue. A series of investigations, undertaken by Lebedeff in the clinical department of the pathological laboratory at Berlin, leads him also to the conclusion that the ingested fat is deposited unchanged in the fatty tissue of the body. Two dogs were kept fasting for a month, losing in the time about forty per cent of their weight. Previous experiments have shown that, under these circumstances, all the fat of the body disappears. The dogs were then fed on a diet which consisted of large quantities of fat foreign to their own nature, and a small quantity of flesh. Both dogs regained their normal weight in three weeks, and were then killed. One had been fed on linseed oil, and from its tissues was obtained more than a kilogramme of fatty oil, which did not become solid at the freezing point of water, and which corresponded closely in chemical characters to linseed oil. The second dog was fed on mutton suet, which had a boiling point about 50° C., and in its body, in the muscles, about the internal organs, and beneath the skin, a form of fat was found which was almost identical with suet. The organs of each dog were free from disease. Thus it would appear that ingested fat, even such as is foreign to the individual constitution, may yet become transformed directly into the fatty tissue of the animal. Other experiments of the same investigator seem to show that this is true also of milk fat.—*Lancet.*

### The Position and Movements of the Stomach.

According to Dr. Leshaft, the Professor of Anatomy at St. Petersburg, the statements current in anatomical text-books regarding the normal position of the stomach are erroneous. He has made careful observations on the point in more than twelve hundred bodies, and has arrived at the following conclusions; The stomach does not, as is usually asserted, lie horizontally in the abdominal cavity, but vertically, so that the fundus touches the diaphragm; the smaller curvature and pylorus are to the right, and the larger curvature is to the left. Its position is in the left hypochondrium, and the situation of the pylorus is in the vertical line formed by a continuation of the right margin of the sternum. If the stomach is enlarged, no one part can be alone displaced, but all parts are equally moved by the distention. The arrangement of the muscular fibers of the stomach is such that food entering it is moved toward the pylorus, where it can be most thoroughly mixed with the gastric juices, and it then passes back along the center of the cavity to the fundus, where the resistance is least. This movement of the food along the wall to the pylorus, and back again along the center, is rendered possible by the form of the organ, and it is probable that it is to this movement that the peculiar shape of the fundus is due. As is well known, the fundus is absent in newly-born children. Thus the shape of the stomach determines the long retention of food in the organ for the purposes of digestion, and its slow passage through the pylorus. If the transverse colon is distended with gas, it may rise to the left of the stomach, as high as the fourth intercostal space, and even as high as the fourth rib. If the coils of the small intestine are similarly distended, the lower part of the stomach may be pressed forward, and the stomach may assume a more oblique position. Even a large stomach, accustomed to dietetic repletion, maintains a vertical position, but the pylorus is moved a little upward and to the right.—*The Lancet.*

### Foul Air in School Rooms.

It is seldom that an assembly room of any kind can be found in which the air is not overcharged with impurities. Some of the worst rooms we have known have been those in which the air ought to have been the purest, namely, school rooms. Yet it is seldom, we trust, that the conditions obtaining in school-rooms are quite as deleterious as those found recently in the Packer Institute, Brooklyn, a well endowed school for young women. In response to persistent complaints by the young ladies the *Sanitary Engineer* had the air of the class rooms analyzed, finding in some of them "an amount of impurity present greater than in a crowded theater, in smoking cars, and three times as great as in the public schools of Boston and Philadelphia."

Our contemporary pertinently remarks that such an institution "should be able to claim not only that it furnishes the means of mental culture, but that its pupils are supplied with at least as pure air as is found in the public schools of Boston and Philadelphia. Certainly, this is not a very high standard, but to secure it the amount of air supply in the Packer Institute must be quadrupled and the amount of heating surface largely increased."

A more outspoken statement of the case by the *Times* says that "there were two class-rooms in which the proportion of carbonic acid found in the air was twice as great as that present at 11 o'clock at night in the pit of two of the worst ventilated London theaters, and was only exceeded, according to Buck's tables, by that detected in a few German schools and in the English mines."

To send young people to study in such an atmosphere is simply criminal.

### The Geoduck.

BY JOHN A. BYERS.

The following extract from a list of shells sent with some specimens to Mr. George W. Tryon, jr., the Conservator of the Conchological Section of the Academy of Natural Sciences of Philadelphia, by Mr. Henry Hemphill, appears to me to be of importance as a contribution to economical science, and with Mr. Tryon's permission I am allowed to make use of it for publication.

"*Glycimeris generosa.* Olympia, Washington Territory.

"I send you a fine large specimen of this species. Its flesh is, I think, the most delicious of any bivalve I have ever eaten, not excepting the best oysters.

"When first dug and laid upon its back, it resembles a fat plump duck. The edges of the shell do not meet, but are separated by a breast of flesh [the greatly thickened mantle] about three inches wide, one inch thick, and about a foot long, including about half of its siphon. This portion is cut into thin slices, rolled in meal, and fried. It is exceedingly tender, juicy, and sweet, and about the consistency of scrambled eggs, which it resembles very much in taste. The boys at Olympia call them 'Geoducks;' they dig them on a certain sand bar at extreme low tide, and sell them to a merchant who ships them to Portland, Oregon, where they readily sell at fair prices. The boys inform me that the Indians on the Sound call them Quenux, and dry them for food with the other clams."

To give the reader some idea of the animal, let him suppose that he has before him a huge soft-shelled clam, with a very thick mantle and a very stout siphon projecting from between the valves. From the habit of the animal it is clear that its propagation is effected in very much the same way as our own clam, and that the fry burrows into the sand and keeps the open end of the siphon projecting just above the surface.

The same methods of propagation would apply to both species. Artificial impregnation, which has been accomplished by the writer in the case of the clam, could no doubt be effected in this case. Then, with the proper incubator, or hatching-box, provided with a bibulous membrane interposed before the outlet, the water could flow through and out, without losing the eggs; shallow pans of sand could also be provided at the bottom of the box for the young to bury themselves in, just as has already been proposed in the case of the clam. This is a subject which merits the attention of all interested in keeping up the productiveness and richness of our American shell-fisheries.—*Bulletin U. S. Fish Commission.*

### Magnetic Bricks.

It was lately observed by Herr Kepner, at Salzburg, in the Tyrol, that some old bricks had an attractive or repellent force on a compass. From each of eight varieties of clay in the neighborhood two bricks were moulded, and one of the two in each case was baked. The unbaked bricks had no action on a magnetic needle, but seven of the eight baked bricks proved polarly magnetic. Some further experiments have been made by Herren Kell and Trientl. Particles of powder of the magnetic bricks adhered to a steel magnet. Breunerite, mica-slate, argillaceous iron-garnet, chlorite, and hornblende were, before heating, unmagnetic, but intense heating produced a magnetic polarity, the axis of which seemed to be perpendicular to the plane of stratification.

### An Electrical Balloter.

An electrical apparatus has been devised by a resident of Syracuse for recording votes cast in political and other societies. It provides a number of knobs hidden from all in the room except the person immediately before them. Each knob represents a candidate, and the voter has merely to press whichever he chooses. At each touch a bell rings, thus making more than one vote by the same person impossible without detection. All the bells ring alike. When the voting is finished a register on the side of the machine opposite the knobs is discovered, and the result of the ballot is seen in plain figures.

### Ancient Beads in Africa.

A writer in *All the Year Round* describes two classes of ancient beads much prized by the natives. They are of glass, one kind being opaque, the other clear but rough. They are called respectively Aggry and Popo beads. There are many varieties of Aggry, some more treasured than others; only one of Popo. Both are dug from the earth, where the corpse with which they were interred is thought to have long since perished. The Aggry is found along the west coast, far into the interior. The Popo is rare in Ashanti and Fantiland, becoming more frequent near Lagos. It must not be understood, however, that either sort is common. The Birmingham manufacturers, and more especially the Venetian, have been trying many years to imitate the Aggry bead. To an English eye their success is perfect, but the youngest negro is not deceived. For all their science and study, for all the wondrous effects of the same kind which they have produced in transparent glass, Europeans cannot find the secret of running a colored pattern through and through the opaque substance exacted. They can make a facsimile of the surface, but that is all. The Popo bead has defied all attempts of imitation. Its peculiarity is that the glass looks blue in light, yellow in shadow. This change puzzles European workmen, who could turn out blue beads or yellow exactly like it, 10,000 of them, for a less sum than a single tiny cube of the real sort fetches. The best authorities suppose both kinds to have been of Egyptian manufacture—ancient Egyptian, that is. Such glass is seldom or never found with mummies in the form of beads, but small bottles of material very similar are frequent enough. If this be so, it is not surprising that Aggries and Popos are not discovered in Egyptian tombs. Made for a savage commerce, the civilized manufacturers disdained to use them, and one would only expect to find deposits in the excavation of a merchant's warehouse or of a glass-blower's works. The curious point of the matter is the evidence thus offered of a commerce very much wider than had been credited to Egypt. Chinese and Indian productions have long since been identified in the plunder of her tombs, and it would seem that she dealt, directly or indirectly, with negroid races on the shore of the Atlantic.

In a note on the Aggry (or Aggri) beads, lately read before the Anthropological Institute in London, Mr. J. E. Price said that they sell in Africa for more than their weight in gold, and on the Gold Coast are among the most valued of royal jewels. Mr. Price exhibited specimens of the beads recently discovered in Colchester, England. He thought their presence in England might be explained by the circumstance that when the Romans occupied the country they brought with them many African slaves, who, probably, wore necklaces with Aggry beads attached, and that when the slaves died their necklaces were buried with them.

### The Boracic Acid Treatment of Diphtheria.

Dr. T. D. Harries, of Aberystwith, reports in the *Lancet* a very successful treatment of diphtheria by the local application of boracic acid in solution. The solution is prepared and applied as follows:

Boracic acid, two drachms; glycerine, half an ounce; water, half an ounce—to be applied freely to the fauces every hour at first, diminishing in frequency with the disappearance of the deposit and general symptoms. The application should be continued for some days after the throat has become perfectly clean. If discontinued too abruptly, the deposit is almost certain to re-form, with a return of the general symptoms; and with the view of warding off this danger, I make it a rule to continue painting up to the eighth day, after which date the patient may be considered comparatively safe. The solution seems to have no injurious effect when swallowed, as I have frequently applied an ounce during twenty-four hours in the cases of children of from four to five years of age.

### Chinese Method of Manufacturing Vermilion.

There are three vermilion works in Hong Kong, the method of manufacture being the same in each. The largest works consume about six thousand bottles of mercury annually, and it was in this one that the following operations were witnessed:

*First step.*—A large, very thin iron pan, containing a weighed quantity, about fourteen pounds, of sulphur, is placed over a slow fire, and two-thirds of a bottle of mercury added; as soon as the sulphur begins to melt, the mixture is vigorously stirred with an iron stirrer until it assumes a black pulverulent appearance with some melted sulphur floating on the surface; it is then removed from the fire, the remainder of the bottle of mercury added, and the whole well stirred. A little water is now poured over the mass, which rapidly cools it; the pan is immediately emptied, when it is again ready for the next batch. The whole operation does not last more than ten minutes. The resulting black powder is not a definite sulphide, as uncombined mercury can be seen throughout the whole mass; besides, the quantity of sulphur used is much in excess of the amount required for mercuric sulphide.

*Second step.*—The black powder obtained in the first step is placed in a semi-hemispherical iron pan, built in with brick, and having a fire-place beneath, covered over with broken pieces of porcelain. These are built up in a loose porous manner, so as to fill another semi-hemispherical iron pan, which is then placed over the fixed one and securely luted with clay, a large stone being placed on the top of it to assist in keeping it in its place. The fire is then lighted and kept up for sixteen hours. The whole is then allowed to cool. When the top pan is removed the vermilion, together with the greater part of the broken porcelain, has a brownish-red and polished appearance, the broken surfaces being somewhat brighter and crystalline.

*Third step.*—The sublimed mass obtained in the second step is pounded in a mortar to a coarse powder, and then ground with water between two stones, somewhat after the manner of grinding corn. The resulting semi-fluid mass is transferred to large vats of water, and allowed to settle, the supernatant water removed, and the sediment dried at a gentle heat; when dry, it is again powdered, passed through a sieve, and is then fit for the market.—*H. Maccallum.*

## MISCELLANEOUS INVENTIONS.

Mr. Brooks French, of Fort Wayne, Ind., has patented a simple, easy-working, and effective stop action, by which there may be obtained a greater number and variety of stops with one stop drawer; also, to regulate and control the opening of the mutes by simple devices.

Mr. Rufus W. Blake, of Derby, Conn., has patented a bell attachment for organs, constructed in such a manner that it can be conveniently applied to the organs, and can be readily thrown into and out of gear with the mechanism of the organs.

A novel pencil sharpener has been patented by Mr. Franz F. Kullrich, of Berlin, Germany. The invention consists of two convex plates with roughened surfaces, and having a strip of felt or other fibrous or hairy material attached to their inner ends, which plates are hinged to each other or connected by a spring, so that they can be separated to admit the point of the pencil, and can be pressed together, as the diameter of the pencil point is decreased, by rotating or twirling the point between the roughened plates.

Mr. Edmond A. G. D'Argy, of Paris, France, has patented an improvement in the class of cigarette wrappers which are provided with a moisture-proof coating at one end; and it consists in constructing the wrapper and coated end or portion in one single piece, and in such manner that the wrappers shall be conveniently adapted for being put up in packages for use in making cigarettes at the convenience of the smoker. A cigarette paper which is made saliva-proof before being applied as a wrapper is adapted for making a better cigarette wrapper than can be made by applying a saliva-proof coating after the cigarette is made, since in the latter case the coating is liable to close the end of the cigarette, and, owing to the fact that the coating cannot then be applied to the folded part of the wrapper, the protection thus sought cannot be secured so well as where the paper is prepared in the manner above described; and it is well known that the manufacture of cigarettes with a waterproof coating according to the usual methods has been found impracticable.

An improved flaxseed cleaner has been patented by Mr. George Beal, of Gilman, Iowa. This invention relates to machines for screening flaxseed for the separation of chaff and other impurities. In operation the screen is in a horizontal or slightly inclined position. The material is to be fed by a spout to the screen surface, and during the screening operation a body of material will be on the screen and be worked gradually toward the delivery end. The smaller particles—such as mustard and foxtail seeds—pass through screen and escape; the flaxseed pass through another screen and out at another opening, and the remaining material passes off by a separate spout. The material is supplied to the screen at a uniform rate, and moves forward slowly at a speed regulated by the rapidity and extent of vibration. This insures effective and thorough separation.

An improvement in quilting frames has been patented by Mr. John R. Sheldon, of Montiville, Conn. This invention relates to that class of quilting machines which carry the quilt under the needle arm of the sewing machine, and at the same time give it a transverse motion for stitching the pattern. It will form a perfect pattern and will stitch the last seam in the quilt perfectly.

Mr. William F. Smith, of Overton, Texas, has patented an improved baling press, in which the bale box has the lower part of its ends made flexible and adapted to be elevated with the follower. The object of the invention is to facilitate the baling of cotton by simplifying the operation of introducing the cotton into the press.

An improved wagon hub has been patented by Mr. Angus McKellar of Fort Douglas, Utah Territory. This invention consists of such construction of the metallic hub that the hub is adapted to be used on light freight, farm, and other wagons having wooden axles, the same number of spokes being used in the wheel as is ordinarily used with the wooden hubs used on such wagons.

An improved tire cooler has been patented by Mrs. Dora Ammerman, Thomas Baird and Ebenezer M. Foreman, of Fairmount, Ill. This invention consists of a suitable wheel supporting rack or bed fixed on connected rocking bars of novel design within a water box in such a manner that the wheel rack can be elevated or depressed at will by means of a lever, whereby a wheel, with its heated tire, may be plunged into and raised out of the water in the said box, and the tire thereby quickly and evenly cooled.

An improved broom and scoop mechanism for evaporating pans has been patented by Mr. Carl F. W. Schramm, of Brooklyn, N. Y. The object of this invention is to facilitate removing crystals and other solid matter from evaporating pans, such as are used in the manufacture of soda and other substances. It consists in a brush or scoop mounted on the ends of arms of a revolving shaft journaled above an evaporating pan in such a manner that when the shaft revolves, the brush and scoop will be caused to sweep over the interior surface of the pan and remove the solid matter on the bottom of the pan into a suitable receptacle that is arranged outside of the pan.

Mr. Henry Morris, of Manchester, County of Lancaster, England, has patented a simple and efficient means of signaling between the signalman and the engine driver by the use of a bell or gong, with or without an air whistle, conjointly with the application of the brake when air brakes are used, whether pressure or vacuum, or when electric brakes are applied, whereby the use of fog signals in foggy weather may be rendered unnecessary, the cost of them, and also the cost of plate-layers' wages for laying them, with all the attendant inconveniences, may be saved, and the use of the distance signal and cost of maintenance may, in many cases, be dispensed with, also to test automatically the bell or gong apparatus and the brake, and to indicate to the man in the signal-cabin if his apparatus and connections are in order.

A novel embroidering machine has been patented by Mr. Alfred Heaven, of Manchester, County of Lancaster, England. The object of this invention is to secure circular, oval, or other figures of velvet, satin, or other material to cloth, so that the said figures may be embroidered by an ordinary embroidering-machine. The invention consists of a guide-bar provided with a series of recesses having central apertures, and also in the combination, with the guide-bar provided with recesses and end apertures, of pins hinged to the carriage of the machine which carries the needle-holders, and adapted to enter the end apertures of the said guide-bar, whereby a series of figures is adapted to be held in alignment with and to be placed automatically upon the needles.

### Bat Guano in Texas.

The progress of railway extension in Western Texas has led to the development of the beds of bat guano in certain caves in Uvalde county. A recent visitor says that there are two of these bat-inhabited caves, which have been partially explored. The entrance to the smaller, or Cibolo Cave, is about 50 feet high and 25 feet wide. The passage widens gradually for a distance of about 250 feet, when the outer cave is reached. The bottom is of guano. The shape of the cave is like an inverted bowl. The walls are of limestone and unite nearly 200 feet above in a grand dome. The cave is as dark as Egypt. There appear to be neither stalagmites nor stalactites. This cave is 300 or 400 feet in diameter, and the floor is covered with about 30 feet of guano. In some parts it is believed to be much deeper. The atmosphere is very dry, and five years ago the guano caught fire, the whole surface being burned over to the depth of about four feet. Since then, eight feet of guano have been deposited, so that we have proof that the fertilizer is being deposited at the rate of more than a foot and a half a year. On the inner side of the outer cave, in the side of the dome, about 120 feet from the floor, is an opening about 6 by 8 feet in size. Through this all the bats go to an inner cave, which has never been explored. It is believed, however, to be very extensive, because of the immense number of bats which daily sleep in it, and because at the time of the fire in the outer cave great quantities of smoke escaped through crevices in the rock near the Cibolo River, on the opposite side of the hill, two miles and a half from the main entrance. This inner cave is believed to be fully two miles long and very broad. The Uvalde Cave is said to be about six times as large as the Cibolo Cave. It differs from the latter in being moist instead of dry. There is no running water in either cave.

The district is quite hilly, and is composed altogether of a limestone formation. In the abrupt hills many small caves are known to exist, and all of them are inhabited by bats; but only the two mentioned, it is believed, are of sufficient extent to warrant working for the guano deposits.

The first shipment of guano was made from the Cibolo Cave but a short time ago. It is claimed that analysis shows the guano to be worth from $50 to $60 a ton. The Uvalde Cave deposit has not been touched. It is said that a factory for the production of sulphate of ammonia is to be set up at Uvalde by the company which owns and works the phosphate deposits at Charleston, S. C.

### Removal of Metallic Particles from the Cornea.

The *Glasgow Medical Journal* (February, p 150) quotes from the *Revista de Sciencas Medicas* the following hint as to the treatment of foreign metallic bodies in the cornea. A blacksmith, while forging a piece of iron, received in his left eye a splinter of the metal, every effort made according to the ordinary methods for its removal having failed, Dr. Rodriguez employed a wash consisting of rose water, 90 grammes; iodine, 0·05 gramme; potassium iodide, 0·05 gramme. The result was satisfactory, the particle of metal being converted into iodide of iron and dissolving out, and the cornea regaining its normal condition.

THE Hudson River Tunnel has now reached a distance beneath the river of 839 feet in the North Tunnel, and in the South Tunnel 700 feet. The work is progressing at the rate of 4½ feet per day.

of the people. A revival of the old and healthy habit of living

which the air ought to have been the purest, namely, school rooms. Yet it is seldom, we trust, that the conditions ob-

opposite the knobs is discovered, and the result of the ballot is seen in plain figures.



### Tea.

One of the most valuable and exhaustive contributions to ten literature which we remember to have seen, says the London *Grocer*, is that just published in the form of a cyclopedia, by Messrs. W. B. Whittingham, Gracechurch street, E. C. It consists mainly of compilations from the *Indian Tea Gazette*, a publication in Calcutta that has for a number of years been exclusively devoted to the consideration and discussion of all questions relating to tea in India, from the time of its earliest introduction there down to the latest periods of its importation here. The cultivation of the plant in the different districts and provinces, the selection of soils and manures, and buildings for its manufacture, etc., are all ably treated in this work; and as it deals thoroughly with the scientific, statistical, and domestic branches of the subject, it is a manual of information and instruction well deserving the attention of the tea planter, importer, dealer, and consumer.

In the ten years ending 1876 the imports and consumption of Indian tea in the United Kingdom increased from about 3,000,000 pounds to 28,000,000 pounds, and within the last five years the supply and demand have kept close pace together, till they have reached between 45,000,000 and 46,000,000 pounds! Imagine how this prodigious growth of the tea trade must have benefited the native Indian race and the country to which they belong. Our author says: "Hundreds of thousands of acres of land have been taken out of jungle and planted with tea. Districts hitherto deadly are fast becoming salubrious; coolies are in fair health, instead of dying off like sheep; and the tea industry, which was once looked upon as the last refuge for the destitute, is now viewed as a profession of the highest social rank."

According to the cyclopedia: "We say that a green tea has a fine flavor, also that a congou has a fine flavor, but they are totally unlike." The volatile oil it contains gives to tea its flavor. The effect of this oil is to produce wakefulness; but, on the other hand, the best authorities declare that "theine," another property in tea, does *not* create sleeplessness, being of a nature to soothe and compose. Theine also supplies to the human system what it loses by fatigue. This property in coffee is called caffeine, and the drinking of it is attended with similar results; but at the same time it is well known that "green tea will produce effects on persons that black teas will not," and that there is a greater fermentation in black tea than in green. Tannin, which is a powerful astringent, is another ingredient in tea; when chewed it "puckers up the mouth," but it is thought by some that it aids digestion. "Tasting tea upon an empty stomach is injurious, producing a sense of weakness, as if one had fasted a long while;" and "tea experts," who are at it all day, "are made exceedingly nervous." Some assert that there is nourishment in tea; others say that there is none, and that tea consumes food; while the book we quote from informs us that tea, like liquors and drugs, when taken moderately, will have one effect, but if consumed largely it will produce just the opposite.

With regard to the names of different sorts of teas and their meanings, we may state that "Pekoe" is a term from the Chinese "Pai-hao"—White Down or Hair, because made from young spring leaf buds, while they are still covered with down. "Souchong" is from "Seao-chung," which means Little Sprouts. "Congou" is a corruption of "Kung-fou," or labor; and "Hyson," or He-Chun, signifies Fair Spring; while the meaning of "Young Hyson" (Yu-chien) is, Before the Rains. The instructions for "making tea" are likewise very useful, and cannot be too widely known; and retail grocers might render a service to their consumers by giving them seasonable directions. In the first place, "tea should not be boiled, as the volatile oil will escape with the steam, and a much larger proportion of the tannic acid is extracted, leaving the infusion bitter." The best way to make tea is to have an earthenware teapot, which should be quite hot when the dry tea is put into it. A few minutes after pour in the boiling water upon the tea, which, after "drawing" from seven to ten minutes, "is at the best point for drinking."

A sufficient quantity that is wanted for use directly should be made at the first drawing. The habit of filling the teapot a second or third time is not right, because the theine, which is quickly soluble in scalding water, will have escaped, so that those drinkers who are supplied from the second drawing will lose the most beneficial part of the tea, and will have instead "a decoction composed chiefly of tannin." Churned tea, properly prepared with milk, is a beverage highly prized in Cashmere in entertaining visitors; and we are told that "the ladies there no doubt vent their grievances to sympathetic ears, discuss their bonnets and their babies, and talk scandal over this cup in much the same way as their English sisters do over 'five o'clock tea.'"

### The Medical History of Houses.

A writer in a recent issue of the *Lancet* has broached the very sensible idea that some measures should be taken to furnish tenants with the medical history of their houses. It is well known that much disease is spread among families who are constantly changing their residences, by the unsanitary conditions of apartments which they hire. In many instances the houses are rented at low figures because of defective drains, damp cellars, bad plumbing, unhealthful surroundings, or perhaps because of the previous habitation of them by persons afflicted with contagious diseases. It does not seem to be an impossibility for the health authorities of the different towns to have a list of houses in which contagious diseases have been known to occur, or in which conditions inimical to health are known to exist, for general reference by the public. Such a list would be of great value to the large number of families who are at this season of the year looking around for new homes. In all instances a critical examination of the cellars and drains is more important than the inspection of the parlors and upper floors. And yet, how seldom is this done, and how often the tenants suffer in consequence. If health boards would keep a black list of unhealthy houses the landlords of the same would find it to their interest to look more particularly to the the sanitary welfare of their tenants.—*Medical Record.*

### Franco German War Statistics.

The official history of the "German-French war, 1870–71" has just been completed. The concluding part is filled with statistical information and carefully compiled summaries, which afford a clear conception of the magnitude of the forces which opposed each other in this greatest of all modern wars. The total strength of the German armies is shown by the following enormous figures—viz., 44,420 officers and 1,451,944 men, of whom 33,101 officers and 1,113,254 men have actually taken part in battle. During the armistice the German armies in France were again raised to their full war force, in order to recommence hostilities at once if necessary. On March 1, 1871, there were 823,648 Germans on French soil, including non-combatants, and comprising a field force of 464,231 infantry, 55,562 cavalry and 1,674 guns, besides 105,272 infantry, 5,679 cavalry, and 68 guns on garrison duty in French forts and towns. Altogether Germany had 1,350,408 men under arms at this time, while the French forces at the end of the armistice comprised 251,000 men fit for field service.

The total loss of the Germans, including dead and wounded, was 6,247 officers (inclusive of 81 surgeons, 4 chaplains, and 3 paymasters) and 123,453 rank and file. Of these 17,572 fell on the field of battle, 10,710 died of their wounds, 316 lost their lives by accidents, and 30 committed suicide; total, 28,628, while 12,253 succumbed to disease (typhus, 6,965; dysentery, 2,000; lung affections, 500.) Thus of the total number of deaths—40,881—70 per cent died of wounds and only 30 per cent by disease, while during the campaign of 1866 nearly 60 per cent of all deaths were by disease.

The French losses will never be accurately known, and the [German] general staff's work can only state the numbers of the prisoners of war. Up to the middle of February, 1871, there had been taken to Germany 11,860 French officers and 371,981 men. At the fall of Paris 7,456 officers and 241,686 men surrendered, and 2,192 officers and 88,387 men had been forced to cross the Swiss frontier, so that a total of 21,508 officers and 702,054 men had laid down their arms to the conquerors. The Germans captured a total of 107 flags and eagles, 1,915 field guns and mitrailleuses, 5,526 siege and heavy guns, and 855,000 small arms.

In the Sanitary Service of the German armies there were employed during the war 7,022 surgeons and physicians, 8,336 hospital assistants, 12,707 sick tenders, 7,800 sick bearers, 606 apothecaries with 254 assistants, 1,309 hospital officials, besides 523 officers and 8,398 men of the train and ambulance service, making a total of 46,955 persons. These were distributed throughout the field armies in 53 sanitary detachments, with 197 field hospitals, and 62 reserve hospitals and depots. In addition a large number of reserve hospitals and medical stations, with volunteer help, were established in all parts of Germany, numbering at the end of the war over 1,500. During the seven months of the campaign 290,000 patients were admitted into the field hospitals, while 812,021 were cared for in 368 reserve establishments. During the war the German field posts, with 2,140 officials, established 411 German post offices on French soil, through which were forwarded 101,267,500 letters and postal cards, nearly 3,000,000 newspapers, 2,500,000 packages, and 263,000,000 marks in ready money. The Field Telegraph Department covered the entire seat of war with its network, which at the end of the campaign comprised 525 telegraph stations and 23,510 kilometers of wires.

### Launch of Her Majesty's Ship Edinburgh.

The Edinburgh, lately launched, is 325 feet long, and 68 feet broad. Her present weight is 4,800 tons, but when she is equipped this will be increased to 9,150 tons. Her armament will be four 43-ton breech loading guns in turrets, and four six-inch breech loading guns in the superstructure. She will have an indicated horse power of 6,000, and a crew of 400 men. She will have ten Nordenfelt guns for defense against torpedo boats. In construction she is very much like the Ajax, launched at Pembroke a couple of years ago. She has a central armor belt of three inches upon one inch, with nine and a half feet free board, and six feet depth below load water line. The armor is in two strips, the upper being 14 and the lower 18 inches thick, over a parallel breadth of four feet at the load water line, from which it tapers to eight inches. The semicircular ends of the belt, which are not so thick, are covered with protective plating three inches thick. In the wake of the ports the armor is 16 and elsewhere 14 inches thick. The ram is forged as a part of the stem, beyond which it projects six and a half feet at about nine feet below water load line. There are protective decks three inches thick, four feet below load-water line, and extending two thirds of the length of the armor belt, and before and abaft it. These decks are protected from the inflow of large quantities of water if the ship is struck below water by cork chambers and coffer dams. The engines are supplied by Messrs. Humphreys & Tennant, of London, and are of 6,000 indicated horse power, the screw being driven by an independent set of engines of 3,000 horse power. The Edinburgh's speed will be 14 knots.

### New Jersey Industries.

According to the report of James Bishop, Chief of the Bureau of Statistics of Labor and Industry, New Jersey is ahead of all the other States of the Union combined in the production of silk goods. These goods are manufactured by eighty-four firms, in whose mills were consumed last year 1,572,078 pounds of raw silk. The capital invested in the business is $7,524,200, and the value of the product $18,053,210, one dollar of capital annually reproducing $2.50 in silk goods. The average number of hands employed was 14,152, of whom 5,458 were men, 5,175 women, and 3,489 children. Their average earnings per day were: Men, $1.81; women, $1.01; children, 63 7/8 cents. Skilled men received as high as $4, and skilled women $3 a day. In the entire United States there are 383 silk mills, employing 31,300 hands, who are paid $9,000,000. These mills furnish 39 per cent of all the silk goods now used by us. Twenty years ago all but 13 per cent of the silk goods consumed in the United States were imported.

New Jersey holds the fifth place among the iron producing States. Skilled mechanics earned $2.33 per day and unskilled $1.21. There was paid in wages 16½ per cent of the value of the products manufactured—$10,341,896.

In the hat factories, which produced 538,626 dozen hats, over 31 per cent of the total value of the product went to the employes. The average daily wages was: for men, $2.07; for women, $1.06; for children, 73·05 cents.

In the pottery industry, for every dollar of capital invested $1.12 was produced. It gave employment to 3,682 persons. The average daily wages was $2.01 for men, 88 cents for women, and 70 cents for children.

The brick, glass, and clay industries yielded $1.24 for every dollar invested. Thirty-seven per cent went into the hands of the employes. The average daily wages of men varied from $2 to $1.10, those of women from $1 to 75 cents, those of children from $1.12½ to 40 cents. Skilled workmen earned as high as $5 a day.

Glass blowers and nail cutters were paid the highest wages, their yearly average earnings amounting to from $900 to $1,080.

Unskilled workmen made annual average earnings as follows: Employes in canning factories (10⅓ hours), $237.50; brick yard laborers (10 hours), $366.66; oyster men (11 hours), $368.75; puddlers' helpers (11⅓ hours), $375; nail factory feeders (boys, 10 hours), $287.50; glass batch mixers (10 hours), $390; glass packers (9½ hours), $390.83; railroad employes (10⅔ hours), $399.29; longshoremen (10 hours), $425; miscellaneous iron workers (9¼ hours), $438; miscellaneous glass workmen (10⅔ hours), $383.89; miscellaneous occupations (10¼ hours), $457; laborers unclassified (10⅓ hours), $349.93.

In those industries where all or the greater part of the employes are women or children, the pay is not only comparatively small, but the hours of work are many, and, in general, as the number of hours increase the wages decrease.

Of the 11,000 employes mentioned in the report the wages of 1,916 were increased last year, while those of 571 were reduced. The advance was among glass blowers, harness makers, hatters, iron moulders, shoemakers, trunk makers, machinists, printers, bricklayers, carpenters, masons, painters, and carriage makers. Among those who suffered a reduction were miners and jewelers, and the silk workers in some departments.

Farm wages averaged, without board, $23.39; with board, $14.86 a month. New England paid $22.76, without board, per month, on yearly engagements, but the cost of subsistence there was $9 a month, against $7.53 in New Jersey.

### Ataxy and Sewing Machines.

In the *Union Medicale*, M. Octave Guelliot contributes a valuable paper on two cases of locomotor ataxy in women employed on sewing machines. In hysterical women, working at the sewing machine seems to be, in certain cases, the occasional cause of the appearance of locomotor ataxy. The symptoms commence in the lower limbs and progress upward. Shooting pains traverse the limbs from below upward. Improvement is noticed when the patient rests, and it may last a long time. Working at the machine by means of a treadle probably acts chiefly by the concussion, which is diffused throughout the spinal cord. Therefore the continuous movement of the treadle is dangerous to the workwoman, and endeavors should be made to substitute some other motor for the foot power.

### Fast Ocean Steaming.

The Alaska, of the Guion line, appears to be the fastest of the steamers now plying between New York and Liverpool. On her last trip she left Queenstown on Sunday, April 9, at 1:50 P.M., and reached New York Harbor on Sunday, April 16, at 2:30 P.M.—actual time, 7 days 6 hours 20 minutes. The fastest run during any twenty-four hours was 419 miles. Her passengers might have attended church at Queenstown on the morning of Easter Sunday, and could have been present at divine service in this city the following Sunday evening, thus worshiping on one Sunday in Europe and on the following Sunday in the United States.

## Business and Personal.

*The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.*

For Sale.—29 bound volumes of SCIENTIFIC AMERICAN, commencing with vol. 11, September, 1846. Address A. S. F., 68 Orchard St., Newark, N. J.

Full set United States Patent Office Reports, 1790 to 1871, for sale cheap. G. M. Elliott, Lowell, Mass.

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Steam Pumps. See adv. Smith, Vaile & Co., p. 236.

Wanted—Iron Planer, about 40 inches square by 12 feet long, new or second-hand, at once. Send cuts and cash price to Bentel, Margedant & Co., Hamilton, Ohio.

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Saw Mill Machinery. Stearns Mfg. Co. See p. 221.

Supplee Steam Engine. See adv. p. 221.

The Berryman Feed Water Heater and Purifier and Feed Pump. L. B. Davis' Patent. See illus. adv., p. 237.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 237.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 236.

4 to 40 H. P. Steam Engines. See adv. p. 238.

Ball's Variable Cut-off Engine. See adv., page 252.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Drop Forgings of Iron or Steel. See adv., page 252.

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Paragon School Desk Extension Slides. See adv. p 253.

Brass & Copper in sheets, wire & blanks. See ad. p. 253.

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Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Common Sense Dry Kiln. Adapted to drying of all material where kiln, etc., drying houses are used. See p. 236.

Improved Skinner Portable Engines. Erie, Pa.

Patent Key Seat Cutter. See page 252.

## Notes & Queries

### HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) G. B. M. asks: What solution is used by manufacturers to fasten the caoutchouc on clothes wringers? A. See receipts for marine glue, page 2,510, SUPPLEMENT No. 158.

(2) C. D. R. writes: 1. I am interested in a water ditch for placer mining in the State of Oregon, and I have a question that I have failed to have answered satisfactorily as yet; but I am informed that you have a book that will give me the necessary information. If so, I want it. A. Beardmore's "Hydraulic Tables" will give information on these subjects. 2. I wish to run 150 to 200 inches of water, miner's measure (that is, water running through a 2 inch orifice with 6 inches from the center of the orifice to the level of the water, called a pressure of 6 inches), through a pipe from the side of one hill across a depression to another hill. The water leaves the pipe 20 feet lower than it enters, and has to move 3,200 feet in the pipe, and passes down hill 125 feet, and up hill 115 feet; thus there is 20 feet pressure. Now, what size pipe will it require to convey across this depression 150 inches of water; also, what sized pipe for 200 inches, and how heavy iron should it be made of? The friction is the thing that bothers. Will it make any difference to make the first half, or the half in which the water goes down hill, a little larger than the other half? A. A miner's inch is equal to the discharge of 1,562 cubic feet per minute under a head of 6 inches over the top of opening, 1 inch square; hence two miner's inches = 3·124 cubic feet per minute. According to calculation a 2½ inch diameter pipe, under the conditions given, will discharge 3·7 cubic feet per minute. Your pipe should be same diameter the whole length; and put together so as to have a smooth, even bore, otherwise the pipe should be larger. If the discharge opening is 2 inches square, it is *four* miner's inches, not two; in which case the pipe should be 3½ inches diameter.

### COMMUNICATIONS RECEIVED.

On a Maple Sugar Bush. By H. H.

On Railroad Ties. By W. A.

[OFFICIAL.]

## INDEX OF INVENTIONS

FOR WHICH

**Letters Patent of the United States were Granted in the Week Ending**

**April 4, 1882,**

**AND EACH BEARING THAT DATE.**

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 261 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Air and gas burner, combined, J. Lewis ..... 255,875
Air compressor, W. Wang ..... 255,901
Air machine, cold, H. F. Starbuck ..... 255,895
Alkali, putting up caustic, B. T. Babbitt ..... 255,995
Arm, artificial, D. W. Kolbe ..... 255,796
Auger, earth, C. A. F. Peters ..... 256,009
Bag fastener, C. W. Bradford ..... 255,921
Baling band, hay and cotton, W. S. Gordon ..... 255,908
Balloon, C. P. Fest ..... 255,903
Ballot box, T. F. Dodge ..... 255,891
Bar. See Boring bar.
Battery. See Thermo-electric battery.
Bed bottom, spring, T. Burdick ..... 255,897
Bed, folding cot, C. J. Sundbeck ..... 255,897
Beer cooler, L. J. Birgler ..... 255,726
Bicycle, A. F. Curtin ..... 255,775
Binder, temporary, Brower & Adams (r) ..... 10,073
Board. See Game board.
Boiler. See Steam boiler.
Boiler furnace, G. R. Ricketts ..... 256,051
Bolts, apparatus for brushing polygonal, F. Stansfield ..... 256,005
Boneblack revivifying kilns, cooler for, F. Wetton ..... 255,828
Bookbinding, A. J. Magee ..... 256,022
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"In presenting to machinists a revised edition of this volume, the author would be ungrateful did he omit to express his sincere thanks for the unusual favor with which the former editions have been welcomed by American machinists, and also for the kindly letters of appreciation from the many, on both sides of the Atlantic, with whom he has become acquainted through the medium of it.

"In the revision, the same familiar workshop description of workshop processes that characterized the former editions has been preserved, to the end that the book may be perfectly intelligible to the apprentice, the skilled machinist, and the student."

CONTENTS.—CHAPTER I. LATHE AND MACHINE TOOLS.—Round Nosed Tools, Square Nosed Tools, Holding Tools. Side Tools for Iron, Front Tool for Brass Work, Side Tool for Brass Work. II. CUTTING SPEED AND FEED.—Tables of Cutting Speeds and Feeds, Table for Steel, Table for Wrought Iron, Table for Cast Iron, Table for Brass, Table for Copper. III. BORING TOOLS FOR LATHE WORK.—Boring Tool for Brass, Boring Tool Holders. IV. SCREW-CUTTING TOOLS.—Hand Chasing, To Make a Chaser, To Calculate the Gear Wheels necessary to cut a Thread in a Lathe. V. GENERAL OBSERVATIONS ON LATHE WORK.—H. S. Manning & Co.'s Lathe Dogs and Drivers, Emery Grinders, H. S. Manning & Co.'s Centering Machine, Lathe Work, Emery Cloth and Paper. VI. TURNING ECCENTRICS.—Turning Cranks, To Chuck a Crosshead, Turning Pistons and Rods, Piston Rings, Ball Turning, Cone Plate for Boring in the Lathe, To Turn a Pulley, Turning and Fitting Tapers, Belts, Oiling and Greasing of Belts, Directions for Calculating the Width of Belts Required for Transmitting Different Numbers of Horse Power, Directions for Calculating the Number of Horse Power which a Belt will Transmit, Its Velocity and the Number of Square Inches in Contact with the Smallest Pulley being Known. VII. HAND TURNING.—Roughing Out, The Graver, The Heel Tool, Brass Work, Scrapers, Lathe Chucks, The Sweetland Chuck, Drill Chuck of the Russell Tool Co. VIII. DRILLING IN THE LATHE.—Half-Round Bits, Cutters, Reamers, Shell Reamers. IX. BORING BARS.—Small Boring Bars. X. LAPS.—Allowance for Shrinkage, Crank Pins, Chucking Brasses, Slotting Machine Tools. XI. TWIST DRILLS.—Feeding Drills, Drills and Drilling—Flat Drills, The Farmer Lathe Drill, Drilling Hard Metals, Slotting or Keyway Drills, Pin Drills, Countersink Drills. XII. TOOL STEEL.—Forging Tools, Tool Hardening and Tempering, Hardening, To Harden Springs, Case-Hardening Wrought Iron, To Case-Harden Cast Iron, To Harden Malleable Iron, The Crystallization of Wrought Iron, The Wear of Metal Surfaces, Annealing or Softening, Mixtures of Metals. XIII. TAPS AND DIES.—Adjustable Dies, Dies for Use in Hand Stocks. XIV. VISE WORK—TOOLS.—Calipers, The Square, The Scribing Block, Chipping, Filing, Emery Paper, Tools for Scraping Surfaces, Vise Clamps, Pening, Fitting Brasses to their Boxes, Fitting Link Motions, Fitting Cylinders, Scraped Surfaces, To Make a Surface Plate, To Cut Hard Saw Blades, To Refit Leaky Plugs to their Cocks, Refitting Work by Shrinking it, To Estimate the Weight of a Casting from the Weight of the Pattern, Grades and Speeds for Emery Wheels, Threads of Gas or Steam Pipes, Steam and Water Joints, To Make Spiral Springs, Hardening, Tempering. XV. FITTING CONNECTING RODS.—Drifts, Reverse Keys. XVI. MILLING MACHINES AND MILLING TOOLS. XVII. GRINDSTONE AND TOOL GRINDING.—Uses of Grindstones, Various Kinds of Grindstones, Dry Grinding, Qualities of Different Grindstones, Treatment of Grindstones, Accurate Grinding, Positions for Holding Tools in Grinding. XVIII. LINING OR MARKING OUT WORK.—Importance of Accuracy in Lining out Work, Qualities Necessary for a Marker-out, To Mark an Ellipse, To Find Points through which the Curve of an Ellipse may be Drawn, Tools Employed by the Marker-out, To Divide a Straight Line into Two Equal Parts, To Divide a Straight Line by a Number of Equidistant Points, Measuring Work to be Marked Out, To Mark Out an Engine Guide Bar, Use of the Compass Calipers in Marking Out Work, To Mark Out the Distance between the Centers of Two Hubs of Unequal Height, Marking Holes at a Right Angle, To Line Out a Double Eye, Marking Out an Eccentric, Lining Out Connecting Rods, To Mark Out a Cone Pulley. XIX. TO CALCULATE THE SPEED OF WHEELS, PULLEYS, ETC. XX. THE SLIDE VALVE.—Movements of Piston and Crank, Steam Supply, To Measure the Throw of an Eccentric. XXI. HOW TO SET A SLIDE VALVE. XXII. PUMPS.—Suction Pumps, Force Pumps, Piston Pumps. INDEX.

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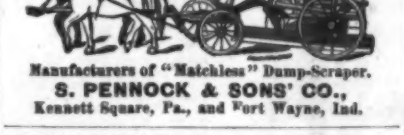

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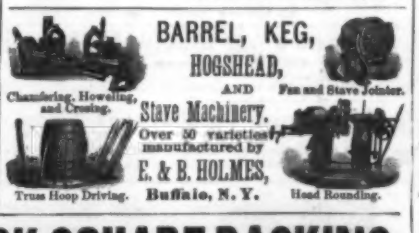


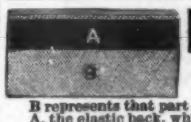


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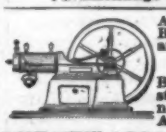

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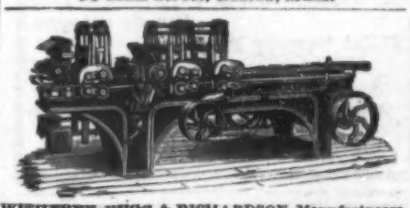

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